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USSR Report

CHEMISTRY

No. 78

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BIOCHEMISTRY

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ENZYMATIC CATALYSIS IN ORGANIC SYNTHESIS

Moscow USPEKHI KHIMII in Russian Vol 50, No 8, Aug 81 pp 1376-1406

MARTINEK, KAREL and SEMENOV, A. N., Department of Chemistry, Moscow State University im. M. V. Lomonosov

[Abstract] This is a survey-type article. Major advances in enzymatic catalysis achieved within the last 10-15 years were related to the considerable progress in research on enzyme properties, functions and structure and the advent of immobilized enzymes. Extensive literature is reviewed herein on preparative methods for using enzymes in small- and large-scale synthesis and on organic syntheses which currently use enzymes. Equilibrium approaches, which increase product yield owing to shifts in the chemical equilibrium, include methods based on low product solubility,(e. g., peptide bond synthesis) and on sequential reactions (e.g., with inorganic pyrophosphate production or cofactor regeneration) and enzymatic synthesis in aqueous organic mixtures (e.g., glycerophosphate synthesis). Methods in which a high product concentration is achieved by kinetics are based on transfer reactions catalyzed by hydrolytic enzymes (e.g., benzylpenicillin synthesis) and kinetically-controlled equilibria. A recent approach is enzymatic synthesis in biphasic systems of water-water-immiscible organic solvent. The enzyme is found in the aqueous phase, which eliminates the traditional problem of enzyme stabilization. Substrates added to the organic solvent diffuse into the aqueous phase and undergo chemical reactions there, and the resulting products diffuse back into the organic phase. The current applications of enzymatic catalysis discussed include the synthesis of oligo- and polynucleotides, labeled compounds (proteins, amino acids, nucleoside triphosphates and sugars) and oligopeptides, ATP regeneration, synthesis and modification of beta-lactam antibiotics, modification of steroids and various industrial processes (large-scale and pilot projects, food products). Figures 12; references 170: 43 Russian, 127 Western.
[150-9307]

CHEMICAL INDUSTRY

CHEMICAL INDUSTRY MINISTER SKETCHES SUCCESSES, HOPES

Moscow AGITATOR in Russian No 9, May 81 pp 24-28

[Article by USSR Minister of Chemical Industry V. Listov: "Chemistry For the People: In Celebration of Chemists' Day, 31 May"]

[Text] This year, workers in chemical industry, mineral fertilizers industry, oil refining and petrochemical industry and microbiological industry celebrate their day in an atmosphere of political and labor upsurge caused by the historical resolutions of the 26th CPSU Congress. Workers in these branches are proud of L. I. Brezhnev's high evaluation of their work in the Accountability Report to the Congress: "Appreciable quantitative and qualitative advances have occurred in chemical and petrochemical industry. During 1971-1980, the output of these branches more than doubled. Particularly great success was achieved in mineral fertilizer production. At the same time, the entire spectrum of chemical production developed."

For example, mineral fertilizer production nearly doubled this past decade, reaching 104 million tons, in conventional units, this past year. In terms of the production of mineral fertilizers, our country has been first in the world for a number of years now. The successes of workers in microbiological industry have also been considerable: during the 15 years since this branch was organized, it has increased its output more than five-fold, including nearly 20-fold for agriculture.

The role of chemistry in developing consumer goods production was stressed at the 26th CPSU Congress. "We expect substantial advances in the production of synthetic fibers and fabrics, plastics, paints and other materials necessary to increase the quantity and, most importantly, improve the quality of consumer goods from the new Ministry of Chemical Industry," noted Comrade L. I. Brezhnev.

In planning ways of further developing the branch, we have carefully analyzed the results of the 10th Five-Year Plan: both the achievements and the difficulties and shortcomings have determined the specific steps which will permit better satisfaction of the needs of the national economy and the population for chemical products.

During this past five-year plan, total output of ministry enterprises increased 26.2 percent.

Branch fixed production assets grew by 7.3 billion rubles through the construction of large new enterprises and the expansion and renovation of existing ones. During this past five-year plan, capacities were introduced to produce upwards of 755,000 tons of plastics and synthetic resins per year, 266,000 tons of chemical fibers and thread, 312,000 tons of caustic soda, 330,000 tons of lacquers and dyes, 505,000 tons of soda ash and 240,000 tons of detergents.

Much attention was paid to the optimum siting of new chemical enterprises, with comprehensive consideration of factors ensuring their efficient operation and the impact on developing productive forces in the country's promising economic regions.

The release of output in the highest quality category at branch enterprises increased more than 3.7-fold during the 10th Five-Year Plan, to 30 percent of the total production volume in 1980. The proportion of the most efficient types of output grew. Thanks to the introduction of scientific developments and progressive technological processes, the technical level of the branch rose. Practically the entire increment in production of the most widely used types of output was ensured through the use of the latest equipment, and foremost, equipment with large unit-capacity.

At the same time, there were serious shortcomings in the operation of chemical industry, which became the subject of serious, justified criticism at the October (1980) CPSU Central Committee Plenum. The presence of disproportions in branch development and the unsatisfactory use of existing capacities were pointed out. The Ministry of Chemical Industry as a whole failed to carry out the 1980 plan and 10th Five-Year Plan in terms of production volume, labor productivity growth and other indicators. The primary reasons were delay in the start-up and utilization of new capacities, the unsatisfactory operation of individual enterprises, as well as inadequate availability of raw material, fuel, electric power, equipment and rail cars for shipping out finished products. All this led to a situation in which branch development lagged behind the demands of the country's economy. Chemical industry workers have drawn appropriate conclusions and outlined ways of reaching the frontiers set in the "Basic Directions" approved by the 26th CPSU Congress.

In the 11th Five-Year Plan, chemical industry must increase production volume 30-33 percent. The production of synthetic resins and plastics will grow especially significantly -- 65-72 percent, to 6-6.25 million tons in 1985. The production of chemical fibers and thread will be increased 36 percent. We plan to expand the release of cultural, personal-services and household goods 1.4- to 1.6-fold.

Along with growth in production volume, particular attention must be paid to producing high-quality polymers with given technical characteristics, chemical output necessary for carrying out the food program, substances for textile industry, synthetic fibers, thread and dyes for light industry, very pure chemical materials and reagents, detergents and catalysts, synthetics to replace food and natural raw material, and we must increase production and improve the assortment and quality of household and photographic chemicals.

These days, scientific and technical progress in practically all branches of the national economy depends on the level of use of polymers as substitutes for expensive natural materials; they possess prescribed properties needed for particular items. Plastics and synthetic resins are being used increasingly in machine building, electrical and radio engineering, aircraft building, light industry and other branches producing consumer goods, agriculture, construction and medicine.

On average for all branches of the national economy, the economic impact of using one ton of plastics is 1,300 rubles, but it is 3,000 rubles or more in tool building and electrical engineering, for example. In particular, the planned production volume for synthetic resins and plastics in 1985 will ensure an increase in the production of thermoplast pipe, which will enable us to save approximately 1.6 million tons of steel pipe. Moreover, polymer materials provide a great labor savings. Production of one ton of plastic requires 540 man-hours less than production of a similar amount of metal.

This past five-year plan, we mastered the production of about 260 new types of plastic and approximately 2,500 items made from them; progressive technologies were developed and tested. In so doing, we laid a foundation which will permit increasing the production of this most important output at accelerated rates in the 11th Five-Year Plan. Synthetic resins and plastics industry is faced with utilizing highly productive new units and flow lines. Thus, low-density polyethylene production will be based on highly productive catalytic systems. New polypropylene production will be based on a "heavy" solvent process. We intend to develop a continuous carbamide resin production process using units with capacities of 60,000 to 100,000 tons per year, as well as a process to produce unsaturated polyester resins from olefin oxides.

Growth in the production of chemical fibers and thread will provide an opportunity to increase their proportion in the textile raw material balance, which is now 23 percent. The increasingly widespread use of such fibers in the technical branches will save natural raw material used in manufacturing consumer goods. We therefore plan to develop and master the production of new synthetic thread with physical-mechanical and use characteristics which will permit a significant expansion of their application to meet technical needs.

We will increase the release and broaden the assortment of these types of chemical output which are intended for use directly in light industry, which will be receiving additional raw material resources; new types of fabric, knitwear and other items will be created. We plan to produce more high-molecular fibers, texturized polyester thread, high-volume polyamide cord used in making carpets. Production of new types of fiber will increase at our enterprises: polyvinylchloride, viscose high-molecular. Krasnoyarskiy Kray recently put into operation the "Sibvolokno" plant, a large facility which will begin producing a new type of artificial fiber fully the equal of cotton and to replace it in manufacturing a broad assortment of high-quality fabrics, knitwear and textiles for the first time in this country. During the new five-year plan, we intend to create other facilities for producing cotton-like viscose fibers. Technology has been developed and production is being mastered for phenilon, a new thermoplastic fiber. A recently created facility for producing nonfabric materials and fibrous items by aerodynamic molding is very promising. The material obtained can be used widely in clothing, footwear, floor coverings and rugs.

Household chemistry products occupy a leading place among cultural, personal-services and household goods being produced by the branch. They are being manufactured at enterprises equipped with modern equipment; they now produce more than 800 such products. In the new five-year plan, we will broaden their assortment and increase the release of detergents, aerosols, cosmetics and many other items in great demand. For example, chemists were comparatively recently being criticized, justly, for the lack of detergents in stores. Measures worked out by the ministry enabled us to increase their production 18 percent last year alone. The increment was achieved as a result of the utilization of fundamentally new technology, a tower method using large unit-capacity equipment. However, several powdered detergents are still inferior to the best foreign models. Special attention is therefore being paid in the current five-year plan to further improving their quality. We plan significant expansion of the assortment of and organizing the production of new types of glues -- multipurpose glues, household glues for lining materials, glues for paper and photographs.

Lacquer and dye industry has the important task of sharply reducing the consumption of food raw material, since it is precisely the shortage in that material which has delayed expansion of lacquer and dye production. Chemists have begun developing and are making increasingly extensive use of synthetic substitutes. Definite successes have already been achieved. Effective vegetable oil substitutes have been enlisted in production. These types of synthetic raw material yield a significant economic impact for the additional reason that many of them are production wastes which industry was not using previously. Large enterprises are already being built to produce synthetic glycerine and other food raw material substitutes. The assortment of lacquer and dye materials is being expanded. New paints are being developed which are more multipurpose and which offer every shade of the color spectrum.

The planned directions of scientific-technical progress in chemical industry will enable us to intensify its development, improve the effectiveness of industrial and agricultural chemization and meet the demands of the population more fully.

Chemical industry plays an important role in developing the country's productive forces, in comprehensive utilization of the natural riches of individual regions, and in particular, the fuel, energy and raw material resources of the eastern regions. Practice has shown that the most effective way of further increasing the potential of large-scale chemistry is to create enterprises of these branches in large territorial production complexes. This is clearly evident in the example of Siberia, where the resolutions of the 26th CPSU Congress anticipate accelerated growth in chemical industry. Thus, one of the largest enterprises in our country, Tomsk Chemical Plant, is being built as part of the Western Siberia territorial production complex, which is the basis of the country's petroleum and gas extraction base. It will ensure the most economical use of the very valuable petroleum and gas raw material of the deposits of Western Siberia.

Many tasks facing chemical industry are being resolved in close cooperation with member-nations of the Council for Economic Mutual Assistance. One of the primary directions of this cooperation in the decade ahead will be implementation of the chemistry subprogram. Its basis is the principle of efficiently distributing chemical production: energy- and materials-intensive production -- primarily near the sources of raw material and fuel; production requiring less energy and materials -- in those countries where fuel and raw material resources are limited.

Having embarked on carrying out the program outlined by the 26th CPSU Congress for further developing chemical industry, branch workers are arming themselves with the experience of leading production collectives and innovators, the most valuable initiatives born of the socialist competition for completing 10th Five-Year Plan assignments ahead of schedule and a worthy greeting to the Party Congress.

Marching in the vanguard of the competition are the collectives of 13 branch enterprises which were awarded the challenge Red Banners of the CPSU Central Committee, USSR Council of Ministers, AUCCTU and Komsomol Central Committee based on 1980 work results. Introducing their experience everywhere is a most important reserve for improving work efficiency in chemical industry in the new five-year plan. For example, the collective at "Polimir" association imeni 50th anniversary of the Belorussian SSR in Novopolotsk has been a model of the thrifty, intelligent use of heat and electric power. Norms for their expenditure were significantly lower than planned, saving about 40 million kilowatt-hours of electricity and 175,000 gigacalories of heat during the 10th Five-Year Plan; by involving recovered energy resources in the technological process, the enterprise meets approximately 40 percent of its production heat requirements. These achievements were evaluated highly in the CPSU Central Committee decree on the work experience of collectives of ferrous and nonferrous metallurgy and chemical industry in using recovered fuel and energy resources. Now that the efficient use of all resources has become a fundamental economic policy, such experience has taken on special significance.

Production innovators, of whom we are rightly proud, are the center of attention for branch workers. Twister G. Usatenko of Berdyanskiy Fiberglass Plant and unwinder V. Atayeva of Kalininskiy Plexiglass and Fiberglass Plant each carried out 15 personal annual assignments in the 10th Five-Year Plan. Two five-year assignments were completed by each of 105 chemical industry workers and more than 50,000 people met their personal five-year plan assignments ahead of schedule. Leading production workers were first to support the call of Moscow worker delegates to the 26th CPSU Congress to meet 1981 assignments by 7 November. Thousands of branch workers have now joined this movement, and many innovators have taken on even tauter obligations.

On the initiative of the red-banner collective of Volga Organic Synthesis Plant and other chemical industry enterprises, competition has developed for completing assignments of the first year of the five-year plan ahead of schedule. Branch workers have successfully carried out the plan for the first quarter for all basic indicators. The enthusiasm and creative upsurge with which all branch workers are now working testifies to their resolve to successfully carry out the large, responsible tasks set by the 26th Party Congress.

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INTEGRATED INDUSTRIAL AND RESIDENTIAL CONSTRUCTION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 16 Jun 81 p 1

[Article by T. Vasilkova, delegate to the 26th CPSU Congress, administrator of the First Solikamsk Ore Administration of the "Uralkaliy" association, Solikamsk, Perm Oblast: "Build and Operate in an Integrated Manner"]

[Text] Following the 26th Party Congress, at which I was a delegate, many people wanted to hear first hand about the congress, and the delegates' speeches. I had more than forty meetings with Solikamsk workers.

At these meetings, the workers, while approving the congress's decisions, also raised the issue of more efficient use of enterprises' existing capacity, the coordinated construction and entry into operation of all installations. Take the "Soyuzkaliy" association, for example. With five ore administrations currently functioning, its managers are planning to put two new enterprises into operation during the current five-year plan. The workers and specialists ask:

"Why increase capacity, when that existing in the "Uralkaliy" isn't completely used?" Our association is capable of producing and shipping 12 million tons of potash fertilizer. Yet in 1979 we produced only 6 million, and 8.3 million tons the year before. The main thing holding back the potash workers is transport. For the last two years, the transport plan has been fulfilled by 50 and 81 percent, respectively. The freight shipment situation is bad not only on our Gorno-Zavodskaya branch line. And it won't basically change in the next year or two: the railroad's traffic capacity is practically exhausted. One has to ask why it is planned to put another plant into operation if existing production can't be moved. Almost one out of five ore managements is idle year round due to insufficient supply of cars, which discourages people and increases turnover. In two year, three thousand people have left "Uralkaliy".

It seems to me that managers of the branch act to a large extent out of inertia when they work to speed up the opening of new plants. I think that in our case it would make more sense to take care of business at home: besides resolving the transport problem, recruit personnel and worry about improving housing and community conditions.

The potash workers were let down in the 9th Five-Year Plan with the start-up of the Second Solikamsk Ore Administration. It didn't begin normal operation until the end of the tenth one. Why was that?

There was no one to work, since housing construction was behind. More than a thousand workers had to be brought by bus each day from the neighboring city of Berezniki. Builders for this enterprise still owe 55,000 square meters, and some workers are still commuting to Solikamsk from Berezniki. The line for housing at the "Uralkaliy" association has stretched to 2500 persons.

We're also short many women workers due to lack of space in kindergartens and nurseries. The Party and the government exhibit a tireless concern for working women, and create conditions so that there will be more children in families. But one of my shift's best instrument operators, Alevtina Trifonova, reluctantly left: there was no one for her to leave her child with. One is forced to wonder which is better: to travel all over the country recruiting new workers for Solikamsk and Berezniki, or to build children's facilities, for which money has already been allocated? In the "Uralkaliy," more than three thousand applications from parents whose children haven't been adequately placed are still awaiting a positive answer.

When the Second Solikamsk Ore Administration started up, the doors should have opened up in the city at a Palace of Culture and Young Pioneer Palace and at a young engineer's club and library. All this is still on the drawing boards. As a result, the ordinary desire to go to the movies has grown into a problem.

Young people are bored. Barely independent fledglings are leaving the nest. I remember the hopes we had when we greeted the young people discharged from the Soviet Army. But there aren't more than 15 of them left in the city. No, the Ural frosts haven't frightened off yesterday's warriors, nor the difficulty of the work (which pays well, by the way) but the unorganized living conditions.

Things aren't so good with on-the-job training of personnel, either. In Perm', I saw an excellent GPTU [City Professional-Technical School] for chemists, with well-equipped offices, laboratories, and workshops. To be sure, a new GPTU building is being built for us, but construction again is going slowly, so there's no telling when it will open. We had our own technical school. I graduated from it, and know many specialists who got their training there. But out graduation was the last one. For some reason, it's now a highway technical school.

Under these conditions, there is every reason to once again undertake extensive and comprehensive calculations to decide which projects, industrial as well as residential, require immediate attention. In my opinion, there shouldn't be a wide separation in our life between professional and personal spheres. If one is detached from the other, or they are developed disproportionately, then ultimately it's the state which ends up losing: the lure of quick profits ends up as a waste of money.

I remember the enthusiastic, prolonged applause with which the delegates at the 26th Party Congress greeted Leonid Ilyich Brezhnev's words: "We must assure strict verification that the resources for social development of enterprises, cities and towns are used exactly as intended, completely, and in the established time limits. Local reports on the opening of new industrial plants usually do not indicate what has been done for those who will work there, how many apartments, kindergartens, libraries and health care centers have been built. Let's make an agreement: such reports will only be considered valid if the plan's program for local residential and cultural construction is also fulfilled. I think the congress will support such a position."

And the congress did support it. The important thing now is not to swerve from this line, to find the right coordination between the increase in industrial capacity, volume of housing construction and level of development of the entire social-personal sphere. I talked as well as I could about the distortion allowed in Solikamsk's development. It's very important not to aggravate the situation. But for some reason, in the Ministry for the Production of Mineral Fertilizers and the "Soyuzkaliy" association, they are once again concerned only with developing productive capacity and aren't very disturbed about the fact that the housing construction plan hasn't been fulfilled since the beginning of the year. It is not only the directors of trusts No 8 and "Zhilstroy", N. Ivanov and V. Neganov, who are responsible for this. They're ready to blame everything on the lack of people and materials. The administration of our "Uralkaliy" association (General Director I. Borchenko) has also been slow in moving. According to the long-range plan, construction of the new Klestovka micro-district should have been in full swing this year. But an untouched forest is standing there--the association was late in preparing the necessary documents. So what about the congress's decisions?

I want to be understood correctly. As a native of Solikamsk, I am proud of the growth in my native city's industrial potential. I am prepared to increase its glory through my own labor. However, there is a lesson in the obvious mistakes of the recent past: to prevent new distortions and to eliminate existing ones, let us, as the saying goes, measure seven times i.e. objectively weigh all our forces, so we can tackle the issue with complete confidence and not be ashamed in front of others.

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CALCIUM CONSERVATION PROBLEMS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 11 Jun 81 p 2

[Letter to the "Mail of Socialist Industry" column by A. Trigub, chief welder of Goskomsyelkhoztekhnika, distinguished agricultural mechanic of the Tatar ASSR: "If Only There Were Carbon"]

[Text] Can a person permit himself to throw away instruments (which happens all around us) which can be repaired, made like new, or even noticeably improved by applying a special coating? This is done using acetylene, obtained by the action of water on calcium carbide. But carbide is a very valuable raw material, indispensable for machine builders, assemblers, shipbuilders, railroad engineers, miners, metallurgists.

This letter involves the question of conserving calcium. There are two ways to make acetylene from it, one expensive and one inexpensive. The former is in mobile generators; the latter, in stationary ones. Calculations show that up to 40% of raw material can be saved by using stationary generators. But tanks are needed for this. Where can they be obtained?

In the territorial supply department of the Tatar ASSR, they answered me as follows: You won't solve the problem of acetylene tanks in Tataria; apply to Moscow. I applied. I was received by the director of the All-Union Association "Soyuzkislorod," L. Vorozhein.

"Who can supply our Goskomsyelkoztekhnika with acetylene tanks--600 of them?" I asked.

"No one," he replied. "There isn't enough activated birch carbon, which is used to fill the tanks to prevent explosion. But try contacting the Leningrad plant 'Lentekhgaz'."

After leaving the "Soyuzkislorod," I went to the Moscow public phone office and called the "Lentekhgaz." I asked whether the plant could deliver acetylene tanks to the Goskomsyelkhoztekhnika of the Tatar ASSR.

"First help us get the activated carbon, then we'll talk about the tanks," they answered.

In general, looking for the charcoal brought me nothing but grief. But at the same time, I know that scientists have developed inexpensive and plentiful materials for replacing activated birch carbon. I'd like to know when they'll finally reach industry? After all, the losses which Tataria alone is incurring, in the production of acetylene, number in the hundreds of thousands of rubles.

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PROBLEMS AT AZERBAIJAN INDUSTRIAL RUBBER PLANT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 30 Jul 81 p 1

[Article in column "The Paper Has Spoken; What Has Been Done?: A Strict Demand, Concrete Help," author not indicated]

[Text] The Central Committee Bureau of the Azerbaijan Communist Party has reviewed the question of the operations of the association "Azrezinotekhnika" to raise production efficiency and product quality. The question was discussed in connection with the article "Flowerbed on the Performance Indices Board," published in SOTSIALISTICHESKAYA INDUSTRIYA on 24 April 1981.

The bureau noted that in the "Azrezinotekhnika" association there are serious shortcomings and omissions at its pilot plant: the Mingechaursk Industrial Rubber Products Plant. The association hasn't coped with its production assignments for a number of years. Demands on personnel are low at all levels, there are major shortcomings in production organization, and labor and industrial discipline is not observed.

The operation of the Mingechaursk reclaiming plant is unsatisfactory; it is working at only 25-30% capacity. When the plant went into operation, it was reported that there were four reclaimed rubber output lines in use. In reality, only one is working. The resin warehouse and refrigerator station have been considered to be in operation since 1976. In fact, they haven't been working at all. Social and living problems are solved slowly at the enterprise.

The bureau's members were not satisfied by the explanation of the association's general director K. Dzhalalov. While admitting the criticism's validity, he referred to construction delays, supply difficulties and the worn-out equipment. It was noted that in his year on the job the general director had not taken the necessary steps to establish basic order at the plant.

The presentation before the bureau of the secretary of the association's party committee, E. Piriev, seemed a formality. He was unable to provide a serious analysis of the reasons for the conditions at the enterprise.

The USSR Ministry of the Petrochemical Industry and the VPO "Soyuzrezinotekhnika" are well acquainted with the situation at "Azrezinotekhnika." Deputy VPO director V. Razgonov was present at the bureau's meeting and participated in the discussion of the issue. To put it lightly, the All-Union association's position creates perplexity. The enterprise under his authority has been operating badly for several years in a row. The ministry has sent five commissions to Mingechaur, none of which left a noticeable trace. The ministry recently issued an order on the reconstruction of "Azrezinotekhnika." An encouraging measure, it would seem. However, this order's equipment delivery dates are set for 1982-1983.

The bureau members' objections in this regard were convincing: the reconstruction dates must be moved up.

Candidate member of the Politburo of the CPSU Central Committee, First Secretary of the Central Committee of the Azerbaijan Communist Party G. A. Aliyev spoke on the question under discussion. He stated that the Association of Industrial Rubber Products occupies a rather solid position in Azerbaijan's industry. However, as the discussion of the question before the bureau shows, the Mingechaur city party organization, republic economic organizations and the All-Union Association "Soyuzrezinotekhnika" have not dealt with the Mingechaur association in a coordinated fashion. Although it has existed for ten years, it hasn't really been developed. In this connection, I consider the article in SOTSIALISTICHESKAYA INDUSTRIYA to be timely.

G. A. Aliyev pointed to the low level of management and the lack of initiative and absence of self-criticism in the work of the association's directors. Comments were made addressed to the Mingechaur city committee of the Party.

The directive approved by the Bureau of the Central Committee of the Azerbaijan Communist Party instructed the business management and party organization of the "Azrezinotekhnika" association to carry out, in the 11th Five-Year Plan, the reconstruction and industrial refitting of the main plants, and modernization and replacement of obsolete equipment. A request was addressed to the USSR Ministry of the Petrochemical Industry to allocate the required capital investments to the "Azrezinotekhnika" association for performing reconstruction and industrial refitting of the Mingechaur industrial rubber products and reclaim plants, and deliver equipment for this ahead of schedule in 1981-1982. Gosplan of the Azerbaijan SSR, the republic's Ministry of Industrial Construction and Glavazmontazhspetsstroy are in charge of resolving construction and renovation questions.

The directive of the Bureau of the Central Committee charged the corresponding organizations and departments to draw up within two months a concrete program for training personnel for the "Azrezinotekhnika" association's plants for the 11th Five-Year Plan, allowing for complete provision for the association's need for specialists. The republic's Academy of Sciences has been asked to study the advisability of organizing a problem-solving sectoral laboratory for industrial rubber products at the association's main plant.

The directive of the Central Committee of the Azerbaijan Communist Party defined measures for reinforcing the direction of economic activity and for improving ideological and educational work and social development of personnel.

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BRIEFS

PRIKUMSK PLASTICS PLANT—Comrade L. I. Brezhnev, in his Accountability Report to the 26th CPSU Congress, included the Prikumsk Plastics Plant among the enterprises forming the nucleus of the modern chemical industry. Today, on the eve of May Day, the last large-tonnage automatic reactor of low pressure polyethylene polymerization went into operation. This enterprise will now produce almost as much of this product as did the entire country before. Prikumsk polyethylene will replace metals in many industrial sectors. The young firm's staff has also pledged itself to put into operation by the end of May industrial equipment for producing benzene, used in the manufacture of paints and lacquers, a number of plastics and industrial fibers and compounds for combatting agricultural pests. [Budennovsk (Stavropolskiy Kray), Apr 30 (TASS correspondent N. Styazhkin)] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 1 May 81 p 1] 9875

OIL INDUSTRY DEVELOPMENT—The Ministry of Chemical and Petroleum Machine Building has reviewed the critical comments contained in the survey "The Development of the Oil Industry" (EKONOMICHESKAYA GAZETA, No 14). Allow me to inform you that in the 11th Five-Year Plan, at the request of the Ministry of the Petroleum Industry, a complex of modular automated equipment is being developed for central oil, gas and water collection and preparation stations, with a productivity of one million tons a year. Its introduction will make it possible to substantially speed up oil deposit development through industrial construction. Work is continuing on creating equipment and special technical resources to increase oil recovery of pools to 55-60%. Technical documentation has been compiled and manufacture is under way for modular equipment of a compressor station with a 6,000-kW centrifugal compressor, which should be delivered in the fourth quarter of 1981 to the Samotlor deposit for testing. Renovation of the plant imeni Dzerzhinskiy is planned, which will enable production of 35,000 gas lift valves and 20,000 well chambers a year. Submersible electric pump output is to rise to 17,500 by 1985. Measures are being taken to create and master serial production in the current five-year plan of new, high-capacity designs of a rock-crushing instrument and bottom hole hydraulic engines. The ministry will ensure a rise in quality and increase in production of drilling equipment and instruments created previously on the basis of technical refitting of working enterprises, as well as the creation of additional productive capacity at these enterprises. [V. Reznichenko, deputy director of chemical and petroleum machine building, "The Development of the Oil Industry"] [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 30, Jul 81 page number not given] 9875

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ACHIEVEMENTS OF CHEMICAL MINING INDUSTRY DURING 10TH FIVE-YEAR PLAN AND GOALS FOR 1981-1982

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 7, Jul 81 pp 387-390

KOZHEVNIKOV, A. O.

[Abstract] The goals of the 10th Five-Year Plan in the title industry have been overachieved. Out of 82 individual activities, only the production of sulfuric acid failed to reach the objective. Along with volume growth, many new items reached the production stage, among them highly concentrated and complex fertilizers. On the economical side of this operation, expenditures increased and capital returns dropped significantly because of poorer mining conditions and continuously worsening ore quality. Therefore new technology needs to be developed and put into operation: larger tonnage for hauling and excavating equipment, automation, etc. The USSR is the third largest holder of phosphate reserves, but the ore is poor and its mineralogical composition is complex. Considerable effort was devoted to work on ore enrichment, including chemical and pyrochemical approaches. The primary goal for the 11th Five-Year Plan is to produce 150-155 M tons of phosphate fertilizers, requiring about a 22% increase in mining productivity. To achieve this, new undertakings must be put in operation. About 1.4 billion rubles will be assigned to these projects, of which 24% will be for new construction, while the rest will be spent on existing operations. Close attention will be paid to protection of the environment, since all of these plans will require land and water commitment.
[113-7813]

FERTILIZERS

AMMONIA PLANT UNDER CONSTRUCTION IN CHIRCHIK

Tashkent EKONOMIKA I ZHIZN' in Russian No 4, Apr 81 pp 33-36

[Article by V. Chernomorskiy: "New Construction Project in Chirchik"]

[Text] I shall start my story about a new construction project of the Chirchik Construction Trust No 160 with the grand meeting of the city's community at which Chairman of the Presidium of the Supreme Soviet of the Uzbek SSR I. B. Usmankhodzhayev presented awards of our country to the builders, installation workers, and designers of a unique complex for the production of caprolactam and ammonium sulphate. Golden stars of Heroes of Socialist Labor began to shine on the chest of the N. I. Yermolayeva, finishing brigade leader of the SU [Construction Administration] "Chirchikkhimstroy" and L. A. Zakharov, brigade leader of fitters and installation workers of the Almalyk MU [Installation Administration] "Promtekhmontazh". Orders and medals were awarded to the following: A. I. Miselev, brigade leader of fitters and installation workers of the Tashkent MU "Stal'montazh"; F. G. Poturemskiy, secretary of the Tashkent Oblast Party Committee; K. K. Gan'kin and N. Ye. Shkitin, brigade leaders of complex brigades of the construction trust No 160, A. T. Artamonov, PMK-15 excavator operator of the association "Uztransspetsstroy", M. L. Davydov, head of the Chirchik MU of the trust "Uzelektromontazh"; A. K. Kerimov, manager of Trust No 160; I. A. El'yukin, assistant manager of Trust No 160... 250 order and medals were awarded to the best participants of this unprecedented construction project in our country which was completed (and this has been acknowledged) much faster than the normal deadlines and was delivered for operation with the evaluation "excellent".

The workers of the Construction Trust No 160 and its subcontracting organizations passed the most complicated examination for professional maturity with flying colors.

Trust manager A. K. Kerimov said: "How many more such examinations do we have ahead of us! Two construction projects which we started this year are probably just as complicated as the 'caprolactam' project and as extensive with respect to the volume of construction and installation jobs. One of them is a complex for the production of ammonia for the association 'Elektrokhimprom'. The builders named it 'large-scale ammonia'. The estimated cost of jobs on the first-priority complex indicates how strenuous its construction will be: 33 million rubles, and completion deadline -- 32 months. And all this with an increasing production pace on the second large project for the Academy of Sciences of the Uzbek SSR, annual introduction of new capacities at the Uzbek combine of refractory and heat-resistant metals, other Chirchik enterprises, as well as at least 60,000 square meters of residential housing and many social, cultural, and personal services facilities. But there are also some advantages because several facilities similar to our 'large-scale ammonia' were already built in our country, and one of them has been under construction in Fergana since 1978. There is no doubt that every bit of the valuable experience acquired by our colleagues will be used by us."

What is the new complex under constructruction and why is it being built in Chirchik? I directed these questions to the chief engineer of the project of the Chirchik branch of the State Institute of the Nitrogen Industry, Yu. I. Kochurenko.

Yuriy Ivanovich Kochurenko told us the following: "First of all I would like to recall where ammonia is used. It is used to produce nitric acid, carbamide, and ammonium nitrate, i.e., the majority of the products of 'Elektrokhimprom' Association. The three existing process lines can no longer meet the needs of the association in ammonia, particularly because one of them with a capacity of 120,000 tons a year built in the forties is too old and outdated. It will be eliminated. The standardized Am-76 unit equipped with the most up-to-date equipment, half imported and half domestic, has a capacity of 450,000 tons. It will be operated by 95 people, less than one half of the number of people working on the process line to be closed."

The ammonia production process is quite complicated. This hydrazoic compound is synthesized from natural gas under tremendous pressure: 320 atmospheres. First, sulfurous and other admixtures, as well as carbonic acid compounds, must be thoroughly removed from the gas. Therefore, the complex has the following buildings, building 01 -- services facilities for the employees and central control station; building 02 -- compression, power facilities; building 03 -- conversion of methane and carbon monoxide; building 04 -- absorption, refrigeration station, methanation, synthesis; building 05 -- unit for preparing feed water, boiler room, power substation, feed-water pumps, fuel spray unit. In addition to this, there are facilities for purifying nitrogen-containing drainage, warehouses, and many others.

Yu. I. Kochurenko showed me the layout of the buildings. I was surprised because they were arranged in a very small area, approximately 9-10 hectares. But, for example, just one of the buildings is 280 meters long... and the entire construction site is surrounded on all sides by operating plants of the association. For a comparison: "caprolactam" was built in an open space, and its area was 50 hectares.

I was even more surprised when, having come to the construction site, I heard explosions... where!? At a place where, one would think, such things should be strictly prohibited. Explosions one after another, and I could see that dust was rising at the future location of Building 04. A group of construction workers was standing and admiring the careful work of the specialists from the Tashkent Administration of the Trust "Soyuzvzryvprom" [Trust for Drilling and Blasting Operations]: "Even the windows are not rattling!"

But still, is it justifiable to conduct blasting operations here?

A. I. Morozov, head of the SU of "Chirchikkhimstroy" explained to me: "Look at these 'Chinese' walls of the former coal dump with a feed system. Two underground walls 240 meters long each, two and half meters high and, on the average, one meter thick. They were built immediately after the war from a high-grade reinforced concrete which was becoming stronger and stronger during these years. But these walls must be demolished as soon as possible: according to the schedule, foundations must be completed in May for heavy equipment: synthesis column, absorber, recuperators, condensation columns. These solid foundations with 400 and more cubic meters of concrete in each have to be poured continually in the course of many days. And what about the timbering and the reinforcing jobs?... It is also necessary to build platforms for assembling the above units (they have to be installed as complete units) and to build a concrete road for a crane of unusually high lifting capacity. And so we are blasting the walls, break them with a wedge hammer, and take them to the dump."

The schedule which was mentioned by the young head of the administration who was the bearer of the order "Medal of Honor", cannot be changed, because, according to another schedule, the country's only 350-ton crane will be brought to the construction site in May. It will remain there for not more than three months and all heavy equipment must be installed with its help during that time, after which it will be moved to another large-scale construction site of the national economy.

The clearing of the site is being done by Saidazim Karamanov's brigade. They are working rapidly, loading one dump truck after another with pieces of concrete. Their work is hard, and you cannot apply to it the saying that "to break is easier than to build". For a month they struggled with the concrete, but by the middle of February only 1000 cubic meters out of two was removed.

Time was getting short, and the builders together with the customer found a small reserve of it: to build a road for the crane 40 centimeters thick not for its entire 80-meter length, as was prescribed in the construction project worked out by one of the design subcontractors of the Chirchik GIAP [State Scientific Research and Planning Institute of the Nitrogen Industry], but only at places where the equipment will be installed (50 meters), where the pressure on the ground will actually be extremely high, and to pour 70 millimeter thick concrete in the remaining part. This will save about 2500 cubic meters of concrete. Will the designers agree to that? Let us hope that they will.

In this connection, the builders have to remove another building -- the facilities for the employees of the operating plant. But the customer does not permit them to do that. The customer is right, since the builders, first of all, must build new convenience stations included in the project. It seems that nothing prevented them from building them, however, they delayed the construction and now they are hoping that the customer will give in and vacate the building before the arrival of the crane. This delay was not appropriate for such a reputable construction organization.

This is probably one of few faults for which the organization can be criticized. In all other respects, the highly skilled general contractor performed efficiently and selected a rational strategy of construction from the first days of construction. For example, they gave first priority to the construction of warehouses for refractory materials, calcium carbide, subsidiary materials, chemicals, paints, and others. Now all of them are in the stage of completion.

I asked M. B. Noskovich, head of the production and technical department of "Chirchikkhimstroy" SU, why they rushed so much with the construction of these warehouses which will be needed only after the complex starts operating.

He answered: "We shall be able to use them during the entire time of construction. Moreover, our experience with 'caprolactam' taught us not to put off the construction of such objects. It is very difficult to spare people for their construction during the intense final period of construction, and no plants operate without warehouses. They do not require a large number of pipes and metal structures with which there is usually a problem during the first year of construction. Finally, having completed 'caprolactam' project at the end of last year and having started this year with almost no unfinished jobs, we are able to task our specialized brigades evenly by working on the warehouses. In March, the following brigades started working on their construction: carpenters' brigade headed by Saypidun Bakhriyev, delegate of the 22nd Congress of the Communist Party of Uzbekistan and the 26th Congress of the CPSU, and a brigade of finishing workers headed by Nadezhda Ivanovna Yermolayeva, Hero of Socialist Labor."

All lower-level teams of the administration are gradually switching to the "large-scale ammonia" project and all of them are following the progressive "Zlobin" method. Construction jobs are in progress by the following contractors: Building 01 -- by A. S. Pesterev's masons, Building 02 -- L. P. Gladchenko's concrete workers and N. N. Stepanov's installation workers, Building 03 -- by K. K. Gan'kin's complex brigade. Another large subdivision of the trust will soon join in the job: Building 04 will be built by UNR-225. At the present time, the workers of this organization are working on the layout of the foundations on concrete-cleared sites.

Incidentally, the foundations of the structures of the complex, just as those of the "caprolactam" project, are chiefly solid. It is possible to replace many of them with a sectional variant, but not the majority. The accuracy with which they have to build is probably higher than at the previous construction project of the trust. At the "caprolactam" project, the anchors of the supports were most frequently embedded after the installation of structures and equipment, but here it was just the opposite. It is clear from this that even several millimeters of deviation in the embedded anchor will make it impossible for it to coincide with the mounting hole.

The arriving equipment may have several modifications, therefore, it is indicated in many drawings of foundations that they can be built only in the presence of the equipment. However, not all equipment has been delivered as yet. For example, there is no equipment for the steam reforming unit. This is alarming also because the average time of assembling this unit is rather long. The designers failed to requisition 60-megawatt transformers for the power substation in time, while they have to be ordered at least two years in advance.

In general, there have been many complaints against the designers from the client and the general contractor. There is insufficient design documentation for the job program of this year. But the people in the Chirchik GIAP were puzzled: "According to the agreement, we had to issue documentation for eight million rubles of construction and installation jobs, but we issued for 12 million rubles already. At the present time, we are preparing documentation for the electrical part, measuring instruments, automation devices, water circulation cycle, and others."

B. A. Zhernovnikov, head of the OKS [Capital Construction Department] of the association said: "All this is true, but we are disheartened by the incompleteness of the documentation. For example, there are no work drawings for the installation of equipment and main pipelines. A large amount of nonstandard equipment has to be installed in the complex, and in order to have it manufactured in time, the orders should be placed now. However, the designers did not give us this opportunity. Here is another example: we know from the Fergana experience that each joint of high-pressure pipeline requires one work shift. There are thousands of such joints, and it is desirable to work on most of them in advance..."

Moreover, the association does not agree with the opinion of designers that it is quite sufficient to provide the design documentation and estimates for the first year of construction. The client believes (justly, in my opinion) that, since the complex is of a standard design and the GIAP works chiefly with standardized structures, it is possible to provide complete documentation.

There was no doubt that the general contractor was of the same opinion. However, I. A. El'yukin was not that categorical:

"Here is an interesting example for you. We are trying to decide what to do with a high-voltage cable of the operating plant. It interferes with the jobs of the zero cycle. According to the plan, it has to be transferred to the trestle of the new complex, but it will be possible to build it only after the completion of the main structures. It is a vicious circle. An oversight of the designers? -- Of course. This example shows how complicated is the proper planning of the sequence of operations in our coditions. Another point on which I do not agree with the client is the following: no matter how standard the complex is, equipment is modernized every year and changes slightly, but this also leads to changes in the construction part of the project."

"Still, the designers should prepare their documentation more purposefully. At the present time we don't need their decisions on all KIP and automation, or on the insulation of pipelines. They will not be needed soon. What we need badly is the decisions on the laying of pipelines, as the client understands correctly. Part of the pipes have already been delivered, and the work on assembling the pipes should be started immediately."

"GIAP members are satisfied with the fact that they issued almost 100 percent of drawings for the zero cycle. But the above example (and not it alone) shows clearly that all of them cannot be used at once. We wouldn't have enough people to build all the foundations at once. The designers should see to it that more work be assigned to our subcontractors in accordance with the construction organization plan. The trust cannot execute by itself the entire volume of jobs in the amount of 7.5 million rubles planned for this year..."

"Trust No 160 has quite a few other obstacles on the way to successful fulfillment of the plan. For example, this year the Ministry of Construction of the Uzbek SSR allotted 1000 tons less metal structures than needed for the 'large-scale ammonia' project. And the allotted 2,350 tons will start arriving at Chirchik only in the second quarter. There is a similar situation with the pipe deliveries by the contractor. Because of this, there is a danger that the subcontractors, Trust No 93 and 'Uzstal'konstruktsiya', will not perform jobs costing 3.5 million rubles, as was planned, but approximately one half of them. The ministry was informed by a letter about this. What will be its decision?

"There is a shortage of reinforced steel of the required grade. For example, there was no steel of class A-3 with diameters of 12, 16, and 18 millimeters for the foundation of the reforming furnace. A-2 steel was used for this, increasing the diameter accordingly. This resulted in overspending 5.5 tons of steel on one half of the foundation. Deliveries of anchor bolts of a low-alloy steel are delayed, which delays the production of many other foundations.

"I am afraid that the enumeration of large problems and the so-called minor problems could be very long. I would like to attribute them to the usual difficulties at the beginning of construction. But why are they 'usual'? Do we have to get used to the fact that 'there is always a shortage of something'? The complex program set in the resolution of the CPSU Central Committee and USSR Council of Ministers on the improvement of the management system clearly stresses the necessity of providing all the necessary materials for construction sites in order that nothing would interfere with their completion on the dates planned. And, as Comrade L. I. Brezhnev pointed out at the 26th CPSU Congress, if the departmental or bureaucratic barriers are found along the way of solving economic problems, party organizations must struggle to overcome these barriers and 'resolutely and uncompromisingly guard national interests'."

It can be noted with satisfaction that a party headquarters has been created here from the very beginning of the construction of the complex which is headed by F. G. Poturemskiy, just as during the construction of the "caprolactam" project. Energetic and competent party guidance of the construction work will undoubtedly help to avoid many frustrations and will contribute to effective interaction of the organization of the design and construction jobs.

This journal will follow the progress of the construction of the new complex in Chirchik. It will report regularly how they are solving problems which are of concern to all construction workers of the republic.

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PROGRESS IN PRODUCTION OF FERTILIZERS REPORTED

Moscow EKONOMICHESKAYA GAZETA in Russian No 24, Jun 81 p 3

[Article by G. Il'yin: "Mineral Fertilizers"]

[Text] According to preliminary data, the production of mineral fertilizers in our country has increased by eight percent during the first five months of this year in comparison with the same period of last year. A total of 46 million tons of fertilizers were produced, including 360,000 tons above the plan.

The workers of the Kingisepp Production Association "Fosforit" are setting the pace in the competition for successful fulfillment of the tasks of 1981 and the entire five-year plan. In January-May, they produced 80,000 tons of fertilizers more than was planned. The experience of this leading enterprise in the intensification of technological processes, high level of equipment utilization, and rhythmical work is adopted by many other enterprises of the Ministry for the Production of Mineral Fertilizers.

The following production associations are confidently fulfilling their socialist pledges: Sumy "Khimprom", Severodonetsk and Novomoskovsk "Azot", Voskresensk "Minudobreniya", and Almalyk Chemical Plant. These enterprises have about 130,000 tons of above-plan fertilizers to their credit.

In the first half of this year, enterprises supplying raw materials improved their work. The output of yellow phosphorus increased in five months by 15% against the same period of last year. The following must be mentioned in this connection: Chimkent Association "Fosfor", Dzhambul Association "Khimprom", and "Kuybyshevfosfor" Association. The following are fulfilling their one-year socialist pledges ahead of schedule: Rozdol and Yavorov Production Associations "Sera" [sulfur]. Tens of thousands of tons of the most important raw material for the production of mineral fertilizers were produced in addition to the plan by the association "Apatit".

In spite of the difficulties with railroad transportation, the associations "Uralkaliy" and "Beloruskaliy" were able to cope fully with the task of extracting potassium fertilizers.

However, the possibilities of increasing the output of mineral fertilizers are not used sufficiently. Enterprises of the USSR Ministry of Ferrous Metallurgy and USSR Ministry of Nonferrous Metallurgy producing fertilizers were lagging behind and did not fulfill the five-month plan. Enterprises of the Ministry for the Production of Mineral Fertilizers underproduced tens of thousands of tons of ammonia and sulfuric acid. They include the following: Tol'yatti Production Association "Azot", Gorlovka Production Association "Stirol", and Balakovo and Rustavi Chemical Plants.

The urgent tasks of the ministries are to bring all enterprises to their full capacities, to ensure the observance of the norms for the consumption of raw materials, and to continue work on the improvement of the quality of all types of mineral fertilizers.

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NEW FERTILIZER PLANT PRAISED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 7 Jun 81 p 1

[Article by P. Levchenko, chairman of the Oblast Association "Soyuzsel'khozkhimiya": "Above the Design Capacity"]

[Text] The Sumy Association "Khimprom" produced 100,000 tons of fertilizer above the design capacity during the first six months of this year. All products came out with the State Quality Status Stamp.

This modern shop was designed by the Sumy Branch of "Giprokhim" [State Institute for the Planning of Plants of the Basic Chemical Industry]. It has many advantages over similar facilities constructed earlier: it has better equipment and higher indexes the amount of fertilizers per square meter of the production area. All the necessary conditions have been created here for obtaining high quality products with minimal expenditures, and a high standard of production has been achieved. New technical solutions of the design made it possible to shorten the construction time, to lower cost of construction, and to increase labor productivity. The economic effect of these solutions amounted to 870,000 rubles.

The greatest contribution to the construction and the starting of production was made by the trust "Sumkhimstroy" and organizations of the Ministry of Installation and Special Construction Work of the Ukrainian SSR. Specialists of the trust gave special attention to the use of advanced prefabricated structures. Here, the level of prefabricated construction was 90%, which is 1.6 times higher than the average index of the trust. Concrete, plastering and other jobs were fully mechanized. The shop was ready for operation ten months before the established deadline.

Much credit for the successful completion of construction of the complex should also be given to the Sumy chemical industry workers. Shop director I. Panchenko, machine operators V. Pal'chun and I. Solomko and head of the technical department I. Geleta made many suggestions for improving the technology of production which made it possible to put the production capacity in operation ahead of schedule and to improve the quality of products.

Agricultural workers of the oblast are grateful to the workers of the design and construction organizations of the "Khimprom" Association for the early completion and successful operation of the ammophos complex and are confident that it will help them to accomplish the most important task of increasing the yield of the fields set by the 26th CPSU Congress for the 11th Five-Year Plan.

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FAULTY EQUIPMENT BLAMED FOR POOR PERFORMANCE OF FERTILIZER PLANT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 1 Jul 81 p 2

[Letter from P. Sudilovskiy, general director of "Beloruskaliy" Association, hero of socialist labor, and V. Sukhinin, director of the Minsk branch of the Scientific Research Institute of Technical and Economic Research of the USSR Council of Ministers State Committee for Chemistry, candidate of economic sciences: "Who Will Be Responsible for Spoilage?" Soligorsk]

> [Text] From the Editors: It was mentioned at the 26th Party Congress that, under modern conditions, the significance of personal responsibility of managerial personnel for the final national economic results is increasing. Meanwhile, the actions of the administrators of the Penza Chemical Machine-Building Plant and the All-Union Scientific Research Institute of Halurgy cannot be described as anything else but flagrantly irresponsible because they palmed off obviously faulty equipment on the Soligorsk Association. We are confident that the Ministry of Chemical and Petroleum Machine Building and the Ministry for the Production of Mineral Fertelizers will investigate this immoral act, determine the role of concrete people in it, and give their opinion.

The personnel of the "Beloruskaliy" [Belorussian Potassium] Association has many accomplishments to its credit. It was at the Soligorsk mines that selective extraction of ore was developed for the first time in the industry. Innovations by Belorussian potassium industry workers which made it possible to raise the level of automation of mining jobs and to improve the quality of fertilizers received recognition of specialists. All this helped the workers of "Beloruskaliy" to fulfill consistently and overfulfill the plans for the production of mineral fertilizers for rural workers. However, the plant started ailing since the end of the last five-year plan. It failed to fulfill the task for the last two years. Its personnel is working strenuously this year.

What was the cause of this?

The lagging of "Beloruskaliy" was caused by the 4th Ore Administration. Its first two sections, which were introduced during the 10th Five-Year Plan, were supposed to ensure the planned increase in the output of potassium fertilizers. They were supposed to ensure it, but didn't.

Judging by the documents, the new capacities did not operate properly from the very first days of their introduction. What did really happen? For example, the lifting devices were installed with a delay of four months. It is clear to anybody that you cannot get the ore out of the mine without such devices. It was clear, but nevertheless the state commission signed the acceptance of the equipment. They signed it in spite of the objections of one of the authors of this letter, also a member of the commission, who was compelled to report his disagreement to the administration of the ministry.

The second cause of the lagging of the 4th Ore Administration and the entire association was serious mistakes in the designing of the technology and the manufacturing of the equipment for ore processing. Its designers did not take advantage of many achievements of science and technology used at domestic and foreign potassium enterprises. Instead of this, they used designs of obsolete equipment almost without any substantial changes.

The equipment started operating in the first section of the plant, but the Soligorsk people started rebuilding and redesigning it since the second week of its operation. Alarm signals were sent to the Penza Chemical Maching-Building Plant. But they pretended in Penza that there was no reason for any alarm and continued sending similar units for the next operation lines. The reply of the Penza plant was as follows: "We cannot stop production. Take what is available. We shall modify it later...."

The result of this is: the operation lines for the processing of ore equipped with the Penza equipment are still working with long interruptions. Due to this the preparation plant stood idle for more than 50 days last year. A committee of experts created by the order of the All-Union Production Association "Soyuzkaliy" examined this matter in detail and concluded the following: "Unsatisfactory operation of the plant is due to the disability of its main technological equipment and lack of material labor resources for its rapid repair and restoration ..." Thus, brand new equipment requires repairs and restoration.

For example, we spent seven million rubles on repairs last year. And now we will have to spend twice as much, because new defects come to light as the loads increase. For example, the filters and the drying department do not work well. In other words, the plant will have to stand idle again. Members of the All-Union Scientific Research Institute of Halurgy are also at fault in many respects. It is hard to tell by what they were guided when they included solutions completely unfitting for the potassium industry. For example, according to their design, open-type electric motors were installed in a number of sections, while there should be closed-type motors because of the high concentration of dust. The screens designed by them are not at all suitable for our industry.

Unfortunately, a list of such examples can be continued.

All this created great difficulties for "Beloruskaliy" in fulfilling the plan for the first year of the 11th Five-Year Plan. For altering equipment while the plant is in operation, we have to search for additional material and financial resources and to release people from other sections. This could have been avoided if our designers and machine builders had the feeling of responsibility for the final results of their work.

10,233
CSO: 1841/139

L. I. BREZHNEV CONGRATULATES BUILDERS OF KINGISEPP FERTILIZER PLANT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 2 Jun 81 p 1

[L. I. Brezhnev's congratulatory message to the participants of the construction of the Production Association "Fosforit", Leningradskaya Oblast, of the Ministry for the Production of Mineral Fertilizers: "In Creative Cooperation"]

[Text] Dear Comrades!

I extend my sincere congratulations to all participants in the construction of the Kingisepp Production Association "Fosforit" on their great labor victory: creation in the northwest of our country of large industrial complex for producing over four million tons of high-quality fertilizers a year and raw materials for their production.

The introduction of this complex and making its capacity operational ahead of schedule contribute considerably to the accomplishment of the most important problem of further development of agriculture in the Nonchernozem Zone of the RSFSR. During the years of the 10th Five-Year Plan, kolkhozes and sovkhozes received 11 million tons of phosphorous fertilizers, including more than two million tons above the plan.

The city of Kingisepp is developing along with the extensive industrial construction.

The decisive factor in the achieved successes was the close interaction and creative cooperation of the builders, installers, designers, and the operating personnel who, guided by the Leningrad party organization, organized large-scale socialist competitions, systematically searched jointly for reserves in order to shorten the periods of construction and the start-up of the production capacities, and skillfully used advanced construction methods and achievements of science and technology.

The work of the personnel of the production association "Fosforit" directed toward the fulfillment of the directives of the party on increasing the effectiveness of social production is commendable. It is gratifying that labor productivity at the enterprise increased 1.5-fold in the last five years.

I am confident that you will continue to fulfill energetically and persistently the tasks set by the 26th CPSU Congress for the development of the mineral fertilizer industry and thus will contribute greatly to the implementation of the food program of the party.

Dear comrades, I wish you good health and new labor successes for the welfare of our great country.

10,233
CSO: 1841/139

BRIEFS

SEVERODONETSK NITROGEN PLANT -- Since the beginning of this year, the Severodonetsk Association "Azot" delivered in addition to the plan 7000 tons of mineral fertilizers, 3,150 tons of ammonia, and 325,000 rubles worth of consumer goods to the consumers. Moreover, they conserved more than 40 million kilowatt-hours of electric power and a lot of gas and steam. Their strict rule of energy conservation makes it possible for them to fulfill an important point of their social pledges: one day of each month they work using the conserved energy sources. [By V. Mikhaylichenko, Severodonetsk, Voroshilovgradskaya Oblast] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 12 May 81 p 1] 10,233

NEW CARBAMIDE PLANT -- The first tons of carbamide have been produced at the new plant of mineral fertilizers of the "Permnefteorgsintez" association. The three-year long intensive work has been completed by many thousands of builders, installers and adjusters. This complex will be producing about one million tons of high quality carbamide granules every year. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 7 Jun 81 p 2] 10,233

NOVOMOSKOVSK MINERAL FERTILIZER PLANT -- Novomoskovsk Production Association "Azot" imeni V. I. Lenin recently delivered the millionth ton of mineral fertilizer since the beginning of this year. About 20,000 tons of granular fertilizer were produced above the plan. The basis of their success was skillfully organized competitions for achieving the highest final results. This association was awarded orders twice, and is now responding to the resolutions of the 26th CPSU Congress. The Guidlines for Economic and Social Development of the country envisaged to produce 150-'55 million tons of mineral fertilizer in 1985. This plant will make a substantial contribution: 22.5 million tons. The first million is a confident beginning of the 11th Five-Year Plan. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 13 Jun 81 p 1] 10,233

VAKHSH NITROGENOUS FERTILIZER PLANT -- A great labor victory was won a few days ago by the workers of the Vakhsh Nitrogenous Fertilizer Plant in Tajikistan. The six-month task in the production of mineral fertilizer was fulfilled ahead of schedule. Two million tons of carbamide have been produced since the foundation of the enterprise. The last batch of the two million tons was produced by the leading shift in the competiion with V. Yadrintsev as a foreman. The Vakhsh Nigrogenous Fertilizer Plant is the first chemical plant of the republic. Every year the pace of its production is growing. It took eight and a half years to produce its first million tons of fertilizer, but the second million took only five and a half years. The quality of its product has improved considerably. At a formal meeting on the occasion of their labor victory, they pledged to produce and sell 10,000 tons of fertilizer above the plan before the end of this year. [By S. Smirnov, Kalininabad] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 30 Jun 81 p 1] 10,233

KEMEROVO ASSOCIATION 'AZOT' -- All facilities which were put into operation last year at the Kemerovo Association "Azot" have reached their design capacity on time and ahead of schedule. Since the beginning of the year the association produced many thousands of tons of sulfuric acid, ammonium nitrate, caprolactam, and other products above the plan. The volume of above-plan sales exceeded 6.5 million rubles. [By V. Bobrov, Staff Correspondent, Kemerovo] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 28 Aug 81 p 1] 10,233

CHERKASSY ASSOCIATION 'AZOT' -- This year the Cherkassy Association "Azot" has delivered more than 70,000 tons of mineral fertilizers to rural areas. During this time, the share of the high-grade products increased here to 60%. Recently, two more kinds of mineral fertilizers, ammonium nitrate and liquid ammonia, were awarded the right to be marked by the pentagonal stamp of quality. This was achieved due to the introduction of a complex quality control system. The personnel of the association decided that they should strive for 80% of their fertilizers to be in the highest quality class by the end of the five-year plan. [By D. Bondar, Cherkassy] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 4 Sep 81 p 1] 10,233

CSO: 1841/139

UDC 661.632.231

PRODUCING PHOSPHORUS-POTASSIUM FERTILIZERS WITH EQUIPMENT OF SUPERPHOSPHATE SHOPS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 7, Jul 81 pp 407-408

ALOSMANOV, M. S., IBRAGIMOVA, S. M., SARDALY, R. A. and DZHAFAROV, A. P.

[Abstract] The reaction conditions for the production of phosphopotash fertilizers based on decomposition of natural phosphates with a mixture of sulfuric and hydrochloric acids in presence of potassium sulfate have been developed in previous laboratory studies. In the present investigation, this process was tested in existing superphosphate shops, scaling up the process to production level. Apatite concentrate containing 39.4% P_2O_5 was used as the starting material along with sulfuric acid (92-94% H_2SO_4), spent sulfuric acid (60% H_2SO_4) and degassed hydrochloric acid (28-31% HCl). All steps of the process performed adequately. Depending on the technological conditions and on the consumption of the reagents, the product contained P_2O_5 from 18.95 to 20.34% and K_2O from 0.92 to 7.3%. The products were weakly hygroscopic reasonably resistant to compacting and could be granulated.
[113-7813]

UDC [661.7:547.466.3-318].004.82:631.895

SYNTHESIS OF MONOACYLUREAS AND THEIR MIXTURES AS POTENTIAL LONG-ACTING FERTILIZERS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, Jun 81 pp 334-335

KRAVCHENYA, N. A. and BUROV, V. I.

[Abstract] An industrial-scale process was developed for obtaining acylurea derivatives from monocarboxylic acids or their mixtures, which are by-products of caprolactam production. Acylureas may be used as long-acting fertilizers, since they are sparingly soluble in water and stimulate the growth of crops. Condensation of urea with monocarboxylic acids or their mixtures was carried

out in fuming sulfuric acid at 50-90°C. The reaction was completed by adding free sulfur trioxide. The resulting monoacylureas were recovered by washing with water. The highest acylurea yields were obtained at a 1:(1.05-1.2):(1-1.1) ratio of carboxylic acid:urea:free sulfur trioxide. The acylurea yield increased with an increase in the sulfur trioxide concentration and rose to 90% if 65% fuming sulfuric acid was used. The IR-spectra of synthesized monoacylureas corresponded to those of ureas synthesized by known procedures. References 8: 3 Russian, 5 Western.
[105-9307]

UDC [622.765.061:622.364.1]"313"

PROSPECTS FOR USING CATIONIC COLLECTORS FOR KARATUA PHOSPHORITE FLOTATION

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, Jun 81 pp 351-353

BASKAKOVA, M. I., ROSLOVA, Z. P. and KOZHEMYAKINA, V. A.

[Abstract] The technology of concentrating Karatau phosphorites [phosphate rock] may be improved by a simpler flotation process in which minerals (siliceous and carbonates) are removed from barren rock in a single stage or sequentially in a medium with a constant pH. The flotation properties of major elements in phosphate rock from Aksay and Dzhanatas deposits in Karatau (phosphate, dolomite, quartz and chalcedony) were used to develop a flotation process for their separation with the use of cationic collectors. Testing of a variety of primary and secondary amines as cationic reagents for extracting siliceous fractions, dolomite and phosphate revealed that the reagents, IM-11, ANP and flotigam (acetate of higher fatty amines) were equal in their collecting ability. The flotation properties of siliceous and carbonate minerals in a medium with a pH from 4 to 9 were similar with the use of IM-11 and ANP. Carbonates were first isolated from ground ore (0.15 mm fractions) with the anionic collector, synthetic fatty acids (C_{10-16}), and the cationic collector (ANP) was added for the flotation of siliceous minerals. After siliceous compounds were removed, a high-quality phosphate concentrate containing 31.1-33.5% P_2O_5 was obtained. Because extensive frothing made purification difficult, a variety of regulating and frothing agents were tested. Addition of gelatinized starch and tripolyphosphate improved froth properties and process selectivity. The use of ANP (0.3-0.4 kg/ton) and gelatinized starch (0.2-0.1 kg/ton) produced high-quality phosphate concentrates (32-34.8% P_2O_5). The optimal concentrate contained 32-33% P_2O_5 and 8-10% insoluble residue at a 70-74% P_2O_5 extraction rate. Figures 5; references 4 Russian.
[105-9307]

UDC 542.91:541.515:547.1'118

NEW PHOSPHORUS-CONTAINING PHENOXYL RADICALS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 8, Aug 81 (manuscript received 12 Jan 81) pp 1865-1873

PROKOF'YEV, A. I., PROVOTOROVA, N. P., KARDANOV, N. A., BUBNOV, N. N., SOLODOVNIKOV, S. P., GODOVIKOV, N. N. and KABACHNIK, M. I., Institute of Heteroorganic Compounds im. A. N. Nesmeyanov, USSR Academy of Sciences, Moscow

[Abstract] Interaction of sterically-hindered p-hydroxycarbonyl compounds and organophosphorus compounds with a reactive P-H bond (2,6-di-tert-butyl-p-benzoquinone, 2,6-di-tert-butyl-α,α-diphenylmethylenequinone, 2,6-di-tert-butyl-4-formylphenol, 2,6-di-tert-butyl-4-acetylphenol and 2,6-di-tert-butyl-4-acetoacetylphenol) produced phosphorus-containing sterically-hindered phenols which can be oxidized by PbO_2 to relatively stable phenoxyl radicals. These radicals are suitable for studying the effect of structural factors on the spectra of these particles. A diastereomeric effect appeared in electron spin resonance (ESR) spectra, if there were two asymmetric centers in the radicals. ESR spectra, hyperfine coupling constants and the effect of temperature on these parameters were determined. Figures 5; references 10: 3 Russian, 7 Western.
[151-9307]

UDC 535.379:546.791.6

CHEMILUMINESCENCE OF URANYL DURING SOLID-PHASE OXIDATION OF URANIUM(IV) SULFATE BY XENON DIFLUORIDE

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 8, Aug 81 (manuscript received 24 Apr 81) p 1931

KULESHOV, S. P., PARSHIN, G. S., KLIMOV, V. D. and KAZAKOV, V. P., Institute of Chemistry, Bashkir Branch of the USSR Academy of Sciences, Ufa; Institute of Atomic Energy im. I. V. Kurchatov, Moscow

[Abstract] Emmissions by excited UO_2^{2+} ions were recorded during the combining of $U(SO_4)_2 \cdot nH_2O$ and XeF_2. Keeping the two reagents in a desiccator over H_2SO_4 or the sorption of H_2O from the gas phase by XeF_2, which is also accompanied by chemiluminescence, did not affect the chemiluminescence of U^{4+} oxidation. UO_2^{2+} is formed on the contact surface of crystals. A drop in luminescence is related to uranyl sulfate formation on the surface of uranium(IV) sulfate crystals. References 1 Russian.
[151-9307]

ION EXCHANGE PHENOMENA

UDC 66.064

RADIATION-GRAFTED HOMOGENEOUS ION-EXCHANGE MEMBRANES IN DIALYSIS OF ACID-SALT SOLUTIONS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 54, No 8, Aug 81
(manuscript received 15 Jan 80) pp 1733-1737

SMIRNOVA, N. M., GOLOVNYA, V. A., KHALIPINA, V. B., ROZENBLYUM, N. D., KOCHERGINSKAYA, L. L. and SMIRNOVA, I. V.

[Abstract] Tabular data are presented on the permeability and selectivity of a series of 20-50 μm thick homogeneous ion-exchange membranes used in the dialysis of acid-salt solutions. The membranes were prepared by chemical grafting of monomers (acrylic acid, acrylonitrile, 2,5-methylvinylpyridine, divinylbenzene) to an irradiated 15-30 μm thick polyethylene film. The most effective cation-exchange membrane for elimination of sulfuric acid consisted of membranes with 100-200% (degree of grafting) acrylonitrile and 15-20% styrene; however, these membranes deteriorated functionally with time. The anion-exchange membranes (2,5-methylvinylpyridine and 2,5-methylvinylpyridine + divinylbenzene)showed wigh permeability for the acid but low selectivity. In counter-current dialysis at room temperature acrylonitrile (100%)-styrene (20%) membranes were particularly effective in the regeneration of nitric acid from acid-salt solutions.
References 12: 6 Western, 6 Russian.
[3-12172]

UDC 541.54:546.65'185'171.4

COORDINATION COMPOUNDS OF LANTHANOIDES WITH OCTAMETHYLIMIDODIPHOSPHOTETRAMIDE

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR, SERIYA B: GEOLOGICHESKIYE
KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 8, Aug 81
(manuscript received 16 Mar 81) pp 54-57

TRYASHIN, A. S. and KIRSENKO, V. N., Kiev State University

[Abstract] Conditions are described for the first reported synthesis of coordinated compounds of lanthanoides with octamethylimidophosphotetramide (OMDP), by reacting lanthanoid chlorides or nitrates with NaOMDP in methanol. The resultant $Ln(OMDP)_3$ compounds, where Ln = La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, or Yb, were represented by needle-shaped crystals soluble in nonpolar solvents and volatile in vacuo. These complexes were determined to have a coordination number of 6 on the basis of X-ray diffraction and IR spectra. In excess NaOMDP, $(Ln(OMDP)_{3+n})^{-n}$ type anionic complexes are formed with coordination numbers between 8 and 10. Figures 2; references 7: 2 Russian, 5 Western.
[6-12172]

ORGANOPHOSPHORUS COMPOUNDS

UDC 542.91:547.1'118

ALKYLVINYLAMIDES OF DIALKYLPHOSPHOROUS ACIDS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 8, Aug 81 (manuscript received 12 Dec 80) pp 1908-1909

KIBARDIN, A. M., GRYAZNOV, P. I., GAZIZOV, T. Kh. and PUDOVIK, A. N., Institute of Organic and Physical Cehmistry im. A. Ye. Arbuzov, Kazan' Branch of the USSR Academy of Sciences

[Abstract] N-Butylisobutenylamidodichlorophosphite reacted with alcohols in the presence of triethylamine and pentane to form the corresponding dialkyl-N-butylisobutenylamidophosphites, which are oxidized by oxygen and react readily with sulfur. Physical constants, yields, molecular formula and IR and NMR data are given for the phosphites. References 1 (Russian).
[151-9307]

UDC 541.63:543.422:547.1'118

STRUCTURE OF PHOSPHORYL COMPOUNDS WITH HALOMETHYL GROUPS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 8, Aug 81 (manuscript received 5 Feb 81) pp 1822-1824

RAYEVSKIY, O. A. and MUMZHIYEVA, N. G., Institute of Physiologically Active Substances, USSR Academy of Sciences, Chernogolovka

[Abstract] Proton magnetic resonance spectra were obtained for oxides of bromomethyldimethylphosphine (I) and iodomethyldimethylphosphine (II). Values for chemical shifts and spin-spin coupling constants for methyl protons in I and II were the same in solutions of various polarities, but the medium had a great effect on these parameters for methylene protons. These data plus IR spectra for oxides of di(bromomethyl)methylphosphine, tri(bromomethyl)phosphine and di(iodomethyl)methylphosphine were used to elucidate probable conformers for these compounds. There was a close correlation between the conformer and the specific halogen in the molecule. The trans-conformers predominated in

compounds with a single irregular group. If several irregular groups were present, an increase in the volume of the substituents increased the contribution of steric interactions. Steric interactions predominated in compounds with CH_2I groups. Steric and electrostatic interactions contributed equally to the stereochemistry of compounds with CH_2Br groups. References 11: 1 Czech, 7 Russian, 3 Western.
[151-9307]

UDC 541.124:543.422.25:547.1'118

LINEAR CORRELATION OF BARRIERS TO PYRAMIDAL INVERSION OF PHOSPHORUS WITH ^{31}P CHEMICAL SHIFTS IN ACYLPHOSPHINES

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 8, Aug 81 (manuscript received 21 Jan 81) pp 1769-1776

CHERVIN, I. I., ISOBAYEV, M. D., EL'NATANOV, Yu. I., SHIKHALIYEV, Sh. M., BYSTROV, L. V. and KOSTYANOVSKIY, R. G., Institute of Physical Chemistry, USSR Academy of Sciences, Moscow

[Abstract] Inversion barriers were calculated by the least-squares method with the determination of ^{31}P chemical shifts in R_2PX-type phosphines, when the substituent X has a strong M-effect (COR, CO_2R, $CONR_2$ and CN). This method provided data when inversion barriers could not be determined experimentally by dynamic NMR. The equation could not be used for acylphosphines with a tertiary alkyl-CO group, for di- and tricyanophosphines or for vinylogs of acyl- and cyanophosphines. Figures 1; references 30: 10 Russian, 20 Western.
[151-9307]

UDC 541.39:546.765

BASICITY OF METAL CARBONYL COMPLEXES, COMMUNICATION 14: REACTION OF BENZENECHROMODICARBONYLTRIPHENYLPHOSPHINE WITH APROTONIC ACIDS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 8, Aug 81 (manuscript received 28 Nov 80) pp 1701-1704

KURSANOV, D. N., GINZBURG, A. G., SETKINA, V. N., BARANETSKAYA, N. K. and LOSILKINA, V. I., Institute of Heteroorganic Compounds im. A. N. Nesmeyanov, USSR Academy of Sciences, Moscow

[Abstract] The reaction of $C_6H_6Cr(CO)_2(PPh_3)$ (I), with η^6-benzene ligand, with $HgCl_2$ and $SnCl_4$ was studied as a continuation of the study on the basicity of π-complexes with a single-ring η-ligand. The IR spectra for the insoluble adduct $C_6H_6Cr(CO)_2(PPh_3)\cdot 3HgCl_2$ (II) revealed an increase in the νCO frequency from 1895 and 1835 cm^{-1} to 1960 and 1915 cm^{-1}; the latter band was the more

intense. The IR spectra for the adduct $C_6H_6Cr(CO)_2(PPh_3)\cdot 2SnCl_4$ (III) revealed the appearance of bands at 2000 and 1956 cm^{-1}; the latter band was the more intense. These data indicate that $HgCl_2$ and $SnCl_4$ are coordinated with the Cr atoms, which is the most basic region of the molecule, during the synthesis of II and III with the formation of seven-coordination complexes. References 12: 4 Russian, 8 Western.
[151-9307]

UDC 535.341+539.194+547.26'118

ELECTRONIC STRUCTURE OF SUBSTITUTED TRIPHENYLPHOSPHAZOETHYLENES

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR, SERIYA B: GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 8, Aug 81 (manuscript received 17 Apr 81) pp 39-42

DIDKOVSKIY, V. Ye., TARASEVICH, A. S., BOLDESKUL, I. Ye., PAVLENKO, N. G. and KUKHAR', V. P., corresponding member, Ukrainian SSR Academy of Sciences, Institute of Organic Chemistry, Ukrainian SSR Academy of Sciences

[Abstract] Computerized analyses were conducted on the UV spectra of 1,1-dicyano-2-chloro-2-triphenylphosphazoethylene (I) and 1,1-dicyano-2-dimethylamino-2-triphenylphosphazoethylene (II) in order to delineate the electronic factors responsible for the stability of I and II. The resultant data indicated that the planar structure of I is due to the trans disposition of the P=N and C=C bonds, and that this conformation is maintained by weak nonvalent interactions between P and Cl atoms. The lack of a cis conformation was ascribed to steric effects of the triphenylphosphazo group and the relatively small positive charge on the P atom which did not favor its stabilization by the negative N atom of the adjacent nitrile group. In II, substitution of the dimethylamino group for Cl alters these electronic relationships and favors the establishment of a cis-gauche structure. Figures 1; references 7 (Russian).
[6-12172]

UDC 541.64 : 678.13

SYNTHESIS OF NEW WATER-SOLUBLE NITROGEN-PHOSPHORUS-CONTAINING ANTIPYRENES

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHNOLOGIYA in Russian Vol 24, No 4, Apr 81 (manuscript received 30 Jul 79) pp 471-474

ZUBKOVA, N. S., TYUGANOVA, M. A., SHABLYGIN, N. V. and KIREYEV, V. V., Department of Chemical Fiber Technology, Moscow Textile Institute

[Abstract] Dichloranhydrides of alkylphosphonic acids were first combined with potassium, sodium or ammonium rhodanides, using acetone, chloroform or

methylene chloride as a solvent. The mixture was stirred constantly at 313-323° K, and after the reaction was complete the precipitate was filtered. The compounds obtained were crystalline substances that dissolved in water, methyl and ethyl alcohols and other organic solvents. Their structures and intermediate products were determined using infra-red spectroscopy. In a chloroform medium, an isothiocyanate of methylphosphonic acid was obtained. Various compounds were obtained when acetone and chloroform were used in conjunction with gaseous ammonia. Proton magnetic resonance spectra were used to determine the structures of the compounds. These new nitrogen-phosphorus-containing derivatives can be used for fireproofing fabrics of cellulose and mixtures of cellulose and synthetic fibers. Figures 1; references 3 (Russian).
[118-12131]

UDC: 541.64:547.211

INFRA-RED SPECTRA OF HYDROXYL ABSORPTION AND FEATURES OF TRANSFER OF ELECTRON EFFECTS IN SOLUTIONS OF COMPLEXES OF PHENOL WITH AROMATIC AND WITH ALKYL-AROMATIC PHOSPHINE SULFIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 26 Nov 80) pp 1450-1455

GONCHAROVA, L. V., SHVETS, A. A. and OSIPOV, O. A., Rostov on the Don State University

[Abstract] Solutions of complexes of phenol with monoaryl $XC_6H_4P(S)(CH_3)_2$, and tiaryl $(XC_6H_4)_3PS$ phosphine sulfides in CCl_4 were analyzed on the basis of infra-red spectra after the necessary aryl-methyl phosphine sulfides had been obtained. The symmetrical nature of the absorption bands, the lack of combination bands and the independence of maximum absorption from variations in the ratio of phenol and phosphine sulfide in HCL_4 show a simple 1:1 composition in the tested complexes. A sum of the least squares method was used to determine the correlation of $\nu(OH)$ for three constants. Results showed the best correlation with both phosphine sulfides when ordinary Hammett σ-constants were used. The sensitivity of the thiophosphoryl group to the influence of the substitute reagent was higher for monoaryl than for triaryl phosphine sulfides, but lower than with corresponding oxides. References 15: 10 Russian, 5 Western.
[116-12131]

UDC 547.26'118

REACTION OF MONOTHIOACIDS OF PHOSPHORUS WITH DIAZOACETIC ESTER

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 3 Nov 80) pp 1475-1477

MASTRYUKOVA, T. A., URYUPIN, A. B., ORLOV, M. YEREMICH, D. and KABACHNIK, M. I., Institute of Elementary Organic Compounds, USSR Academy of Sciences; Belgrade University, Yugoslavia

[Abstract] The reactions of several monothioacids of phosphorus, (0,0-diethylthiophosphoric, 0-ethylmethylthiophosphonic, and diisopropylthiophosphonic) with diazoacetic ester in ether and acetonitrile solvents were analyzed using the chromatic mass spectometry method and the nuclear magnetic resonance $^{31}P-[^{1}H]$. Standard compounds were synthesized to assist identification of reaction products. In all cases a mixture of thiole and thione isomers, with very low yields of 3-6%, was formed. This confirmed an earlier concept of the mechanism of reaction of monothioacids with diazoalkanes. Equipment and procedures used are described in the experimental section. References 13: 12 Russian, 1 English.
[116-12131]

UDC 547.341

PROPERTIES OF 2,6-DIPHENYL-4-OXO-4-OXY-1,4-AZOPHOSPHORINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 18 Aug 80) pp 1481-1485

FEDOROVA, G. K., TOLMACHEV, A. A. and FESHCHENKO, N. G., Institute of Organic Chemistry, UkSSR Academy of Sciences

[Abstract] The above nitrous compound was synthesized and its properties compared with those of its oxaphosphorine analog. The azaphosphorine is a weaker acid than the oxaphosphorine; it produces a salt with aliphatic amines and does not react with aniline. Reactions with various reagents and infra-red spectra data are summarized in the experimental section. The 2,6-diphenyl-4-oxo-4-oxy-1,4-azaphosphorine was found to acylate with acetyl and benzoyl chlorides on the nitrogen atom. Thionyl chloride combined to give 2,6-diphenyl-4-oxo-4-chloro-1,4-azaphosphorine, with the chlorine atom readily converted to alkoxy- and amino-groups. A bromine variant was also produced. Figures 1; References 3: 2 Russian, 1 English.
[116-12131]

UDC 547.56 + 535.34 : 542.91

STUDY OF SYN-ANTI-ISOMERISM OF PHOSPHORYLATED AMIDINES AND TRIPHENYLPHOSPHAZOIMINODICHLOROACETYLS USING METHOD OF NUCLEAR MAGNETIC RESONANCE ^{1}H, ^{13}C AND ^{31}P

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 15 Sep 80) pp 1485-1493

NEGREBETSKIY, V. V., BOGEL'FER, L. Ya., SINITSA, A. D., KAL'CHENKO, V. I. and KRISHTAL', V. S., Institute of Organic Chemistry, UkSSR Academy of Sciences, and All-Union Scientific Research Institute for Chemical Plant Protection Agents

[Abstract] Several phosphorylated amidines and N-substituted triphenylphosphazoiminodichloroacetyl compounds were studied using nuclear magnetic resonance ^{1}H, ^{13}C and ^{31}P at room temperature and higher temperature intervals. With higher temperatures the signals spread and blended, while reduction of the temperature brought a return of the earlier form of the spectra. The polarity of the medium was found to be of great importance to the constant of syn-anti-isomerization balance. Activation energy increased with increased polarity of the solvent; this along with other features of reactions were related to tautomeric enamine forms. Proton migration in the triad $Cl_2CH-C=N-$ promoted reactions around the C=N bond. Electron donors at the nitrogen imine hastened, while electron acceptors retarded, the process of syn-anti-isomerization. By analysis of steric effects of substituents on ^{13}C chemical shifts, and on the basis of the $^{3}J_{PC}$ spin-spin reaction constant as a function of the size of the dihedral angle, the spacial structure of the compounds was studied. Figures 2; references 18: 12 Russian, 6 Western.
[116-12131]

UDC 547.298.5 : 547.26' 118

STUDY OF RETARDED INTERNAL ROTATION AROUND C-N BOND IN PHOSPHORYLATED N^{1}-METHYL- AND N^{1},N^{1}-DIMETHYLAMIDINES USING NUCLEAR MAGNETIC RESONANCE ^{1}H AND ^{13}C

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 16 Sep 80) pp 1493-1498

NEGREBETSKIY, V. V., BOGEL'FER, L. Ya., SINITSA, A. D. and KAL'CHENKO, V. I., Institute of Organic Chemistry, UkSSR Academy of Sciences, and All-Union Scientific Research Institute for Chemical Plant Protection Agents

[Abstract] The dynamic stereochemistry of phosphorylated amidines was studied using nuclear magnetic resonance ^{1}H and ^{13}C to determine the effect of phosphorus-containing substitutes that are inclined to $p\pi$-$d\pi$ conjugation, on the process of rotation around the C-N bond in N^{1}-Mono- and dimethyl-substituted

amidines. Results showed that in a temperature range of +30 to -100° C the signals of the dimethylamine group appeared as a singlet, indicating speed of rotation. Stereo-specific spin-spin reactions of the proton-fluorine and carbon-fluorine bonds led to disintegration of doublet components into quartets at high temperatures. Other temperature-dependent aspects of nuclear magnetic resonance are discussed, and the effects of the electron nature and volume of the R radical are shown. The greatest Δ-G# value was for products of benzamidine, where the phenyl ring is apparently conjugated with the conjugated amidine grouping, thus stabilizing the molecule. Polarity changes and the nature of the anion in phosphine salts had little effect. References 14: 7 Russian, 7 Western.
[116-12131]

UDC 547.341

ROLE OF HYDROGEN-CHLORIDE IN REDUCING PRODUCTS OF PHOSPHORUS PENTACHLORIDE PHOSPHORYLATION OF ALKENES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 24 Oct 80) pp 1498-1504

ROZINOV, V. G., RYBKINA, V. V., GLUKHIKH, V. I. and KALABINA, A. V.,
Irkutsk State University imeni A. A. Zhdanov, and Institute of Petro and
Carbochemical Synthesis of Irkutsk State University

[Abstract] To clarify ambiguities that arose in connection with previous studies, the authors studied the reaction of phosphorus pentachloride with styrene and vinyl-ethyl ether, and reduction of the phosphorylation products. Styrene was phosphorylated in phosphorus pentachloride in benzene at room temperature, and then the crystalline complex was reduced using trichlorosilane. Nuclear magnetic resonance ^{31}P showed two compounds, styryldichlorophosphine and β-chloroethyldichlorophosphine. The latter was examined using proton magnetic resonance, showing a multiplet related to the benzene ring protons, and other features. Features of these and other compounds show that only in the presence of hydrogen chloride from products of alkene phosphorylation during reduction were β-chloroethyldichlorophosphines obtained. Details of the chemical processes are presented in an experimental section. Figures 3; references 13: 11 Russian, 2 English.
[116-12131]

UDC 541.62 : 547.569.2.241

ANALYSIS OF CONFORMATIONAL BALANCE AND INTERNAL MOLECULAR REACTIONS IN ALKYLPHENYLSULFIDES AND DIALKYLPHENYLPHOSPHINES USING ULTRAVIOLET AND NUCLEAR MAGNETIC RESONANCE ^{13}C SPECTROGRAPHY

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 31 Oct 80) pp 1504-1511

RATOVSKIY, G. V., PANOV, A. M., GLUKHIKH, V. I., KALABIN, G. A., DMITRIYEV, V. I. and ALIYEV, I. A., Irkutsk State University imeni A. A. Zhdanov

[Abstract] The relative amounts of two forms of conformers in alkylphenylsulfides and dialkylphenylphosphines was studied using comparative ultraviolet and nuclear magnetic resonance spectroscopic readings, and examining the nature of heteroatom reactions with unsaturated fragments in those conformers. Theoretical and experimental expectations and results are presented, with 3 varying methods confirming that changes in the ultraviolet spectra of the compounds can successfully be described on the basis of the balance between the 2 conformers. In carbon 13 nuclear magnetic resonance of $PhPAlk_2$, increasing the alkyl group was shown to be accompanied by a regular shift in the para-hydrocarbon atomic signal of the benzene ring in a weak field. Thus the dimethylphosphine group was a weak donor, with all other groups being acceptors. The proportion of conformers at 25° C showed relative donor and acceptor capabilities for the 2 conformers. References 19: 7 Russian, 13 Western.
[116-12131]

UDC 547.341

SYNTHESIS OF THIOETHERS OF 2-CHLORO-1,3-ALKADIENEPHOSPHONIC ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 18 Aug 80) pp 1511-1517

ANGELOV, Kh. M., and KHRISTOV, V. Kh., Higher Pedagogical Institute, city of Shumen, People's Republic of Bulgaria

[Abstract] The authors showed that the addition of a mixture of mercaptan and triethylamine to an ether solution of dichloroanhydrides of 2-Cl-1,3-alkadienephosphonic acids, with cooling from -8° to -5° C, leads to the formation of thioethers, with no observable splitting off of hydrogen chloride. The structures of the compounds obtained were studied by proton magnetic resonance and infra-red spectroscopy, showing that the thioethers exist as stereoisomers with steric factors as determinants. The dialkyl thioethers of 2-Cl-1,3-alkadienephosphonic acids were here described for the first time. Figures 2; references 9: 8 Russian, 1 Bulgarian.
[116-12131]

UDC 547.26' 118

NUCLEAR MAGNETIC RESONANCE SPECTRAL STUDY OF REACTION OF ISOCYANATODIALKYLPHOSPHITES WITH AROMATIC ALDEHYDES IN PRESENCE OF ALCOHOLS AND WATER

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 8 Oct 80) pp 1521-1524

TARASOVA, R. I., ZYKOVA, T. V., DVOYNISHNIKOVA, T. A., SINITSYNA, N. I. and SALAKHUTDINOV, R. A., Kazan' Chemical Engineering Institute imeni S. M. Kirov

[Abstract] Nuclear magnetic resonance spectral analysis was used to show the course of the reaction of isocyanatodialkylphosphites with aromatic aldehydes in the presence of alcohols and water and to clarify the role of the proton donor reagents. C-phosphorylated carbamates with symmetrical or mixed radicals at the phosphorus are separated. A reactive intermediate stage was discovered, and the disintegration and relation between carbamates was found to depend on the nature of the alcohol used in the reaction. As the radical in the alcohol increased in size and complexity, the path of the reaction varied. The addition of water brought direct hydrolysis of the intermediate product. Figures 1; references 4 (Russian).
[116-12131]

UDC 547.26' 118

SYNTHESIS AND STUDY OF 1,8- AND 1,2-NAPHTHYLENE PHOSPHITES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 19 Aug 80) pp 1528-1533

NIFANT'YEV, E. Ye., MILLIARESI, Ye. Ye., RUCHKINA, N. G., DRUYAN-POLESHCHUK, L. M., VASYANINA, L. K. and TYAN, Ye. A., Moscow State Pedagogical Institute imeni V. I. Lenin

[Abstract] The dependence of properties of the phosphorus atom on the size of intracyclical angles was studied by synthesizing and investigating certain properties of naphthylene phosphites, testing the hypothesis that the structure of the naphthylene ring determines properties of spacial organization of the cycles, as well as the stereochemistry of the phosphorus atom itself. The title compounds were obtained by reacting the corresponding naphthadiodes with PCl_3 in the presence of catalytic quantities of water; use of triethylamine as an acceptor of hydrogen chloride speeded the reaction, but reduced the yield and contaminated the end product. Study of ethers and amines of the end products showed that with heating they fixed sulfur to form corresponding thiophosphates. Chemically the naphthylene phosphites corresponded to analogous aliphatic products. Details of the chemical processes are described in an experimental section. Figures 2; references 7: 4 Russian, 3 English.
[116-12131]

UDC 547.558.1 : 541.67

SYNTHESIS AND STEREOISOMERISM OF 3,7-BIS(DIMETHYLAMINO)-5,10-DIPHENYL-5,10-DIHYDRODIBENZO[b,e]PHOSPHORINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 14 Jul 80) pp 1533-1538

IVANOV, P. Yu., NEGREBETSKIY, V. V., BYCHKOV, N. N. and STEPANOV, B. I., Moscow Chemical Engineering Institute imeni D. I. Mendeleyev, and All-Union Scientific Research Institute for Chemical Plant Protection Agents

[Abstract] The phosphorine examined was produced by the reaction of 3,3'-bis(dimethylamino)triphenylphosphine with benzaldehyde in the presence of hydrochloric acid at temperatures of up to 95° C for 15 hours, with no more than 25% yield of phosphorine. Differences in the proton shift of methyl groups was dependent on the orientation of the phenyl and phosphorus components. Proton magnetic resonance of various isomers tested and the isomer in chloroform showed that a stereoisomer had been isolated, and study of the nuclear magnetic resonance ^{13}C confirmed the structure of both the individual isomer and the mixture. The formation of stereoisomers with an equatorial orientation of the phenyl on the phosphorus atom was regarded as preferable in a number of dihydrodibenzo[b,e]-phosphorines. Details of spectrography and chemical reactions are described in an experimental section. Figures 3; references 11: 4 Russian, 7 Western.
[116-12131]

UDC 547.558.1

PHOSPHORYLATION OF HETEROCYCLIC COMPOUNDS, PART 1: TRIPHENYL-2-HETEROPHOSPHONIUM SALTS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 4 Nov 80) pp 1538-1541

ZHMUROVA, I. N. KOSINSKAYA, I. M. and PINCHUK, A. M., Institute of Organic Chemistry, UkSSR Academy of Sciences

[Abstract] After obtaining triphenyl-2-heterophosphonium salts by prolonged heating of equimolar amounts of triphenylphosphine and 2-halogen products of pyridine, quinoline, benzothiozole and benzoxazole, properties of the salts were studied. The salts were found to be sensitive to nucleophile action, stable in both hot and cold aqueous solutions, but highly soluble in the presence of alkalis, soda and ammonia. The various salts reacted in different ways with sodium p-nitrophenolate. Nuclear magnetic resonance ^{31}P was used to study the structure of the salts, with alcohol, dimethylformamide and acetonitrile as solvents. Details of the chemical procedures and results are presented in the experimental section. References 9: 4 Russian, 5 Western.
[116-12131]

UDC 547.241

REDUCTION OF CHLOROPHOSPHONIUM DERIVATIVES BY P^{III} COMPOUNDS AS HALOGENOPHILE REACTION

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 80
(manuscript received 15 Oct 80) pp 1541-1545

TIMOKHIN, B. V., VENGEL'NIKOVA, V. N., KALABINA, A. V. and DONSKIKH, V. I.,
Irkutsk State University imeni A. A. Zhdanov

[Abstract] Derivatives of P^{III} are known to be mild bases that readily chlorinate with "positive" halogen compounds. The present study combined such bases with chlorophosphonium, and investigated the products obtained using nuclear magnetic resonance 1H and ^{31}P. Experimental data showed that tetrachlorophosphonium tetrachloroaluminate are readily reduced by tri-coordinated phosphorus derivatives, as hypothesized, forming products of the reduction of the phosphorus atom in the initial phosphonium salt and oxidized chlorination of the nucleophile used. Details of the procedures are presented in the experimental section. Tables 2, references 21: 10 Russian, 11 Western.
[116-12131]

UDC 547.341

REACTION OF CHLORANHYDRIDES OF TRIVALENT PHOSPHORIC ACIDS WITH AZOMETHYNES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 4 Nov 80) pp 1545-1539

NURTDINOV, S. Kh., RYABKOV, V. A., GABIDULLINA, R. Sh., ISMAGILOVA, N. M., ZYKOVA, T. V., SULTANOVA, R. B. and TSIVUNIN, V. S., Kazan' Chemical Engineering Institute imeni S. M. Kirov

[Abstract] Reactions of primary and secondary chlorophosphines were studied with certain aliphatic, aliphatic-aromatic and aromatic azomethynes in the presence of acetic acid or alcohol. In all cases the reaction was accompanied by pronounced exothermic effects, and resulted in the formation of either yellow oily liquids or crystalline products. Primary chlorophosphines reacted smoothly with aliphatic-aromatic and aromatic imines to produce alpha-aminoalkylphosphonic acids and ethers. Their structures were determined using infra-red, and nuclear magnetic resonance ^{31}P and ^{1}H spectra. Acids and oxides of tertiary phosphines were also produced. Figures 3; references 9 (Russian).
[116-12131]

UDC 547.241 + 547.341

REACTION OF PRIMARY CHLOROPHOSPHINES WITH AZOMETHYNES AND ACETYLACETONE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 4 Nov 80) pp 1549-1553

NURTDINOV, S. Kh. TSIVUNINA, I. V., SAVRAN, V. I., ISMAGILOVA, N. M., ZYKOVA, T. V. and TSIVUNIN, V. S., Kazan' Chemical Engineering Institute imeni S. M. Kirov

[Abstract] The reaction of ethyldichlorophosphine with acetylacetone in the presence of acetic acid at 60-70° C produced a bicyclic intermediate compound that, when exposed to the air, hydrolyzed to form 2-hydroxy-2-ethyl-3,5-dimethyl-3-hydroxy-5,5-ethyloxaphospholane. Nuclear- and proton magnetic resonance and infra-red spectra studies were used to determine the structure of various products of this process, as well as the reaction of 2-hydroxy-1,2-azaphospholene with alcohol at 150° C for 50 hours. Figures 2; references 16 (Russian).
[116-12131]

UDC 541.132 : 547.241

HEAT EFFECTS OF MULTISTAGE DISSOCIATION OF GLYCINE BISMETHYLENE PHOSPHONIC ACID

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 6 Aug 80) pp 1557-1563

VASIL'YEV, V. P., KOCHERGINA, L. A., MOROZOVA, N. V., RUDOMINO, M. V. and KOLOVA, Ye. K., Ivanovo Chemical Engineering Institute

[Abstract] Calorimeter measurements were made of heat effects of the neutralization of glycine bismethylene phosphonic acid in the presence of $NaOH$, KOH, and KNO_3 mixtures as electrolytes for various ionic force values, or pH intervals. Equipment and procedures are described in the experimental section. Results showed distinct changes in the pH 4-8 range of the balance between particles of HL^{4-}, H_2L^{3-}, H_3L^{2-}, and protons. With increased concentration of the base electrolyte, the heat of acid neutralization varied markedly. In the third and fourth stages of the reaction in the pH 4-8 range, protons separated from the phosphonic groups, and thereafter continued to separate until an absolute value was reached. The data confirm the similarity of the reactions, which had previously been suggested. Figures 3; references 15: 12 Russian, 3 Western.
[116-12131]

UDC 547.241

KINETICS OF ARBUZOV REACTION IN SERIES OF FLUORIDE-CONTAINING PHOSPHITES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 26 May 80) pp 1567-1570

MASLENNIKOV, I. G., LAVRENT'YEV, A. N., KUZ'MINA, N. Ya. and KIRICHENKO, L. N.,
Leningrad Technological Institute imeni Lensovet

[Abstract] The reaction of fluoride-containing phosphites with methyl iodide in an acetonitrile medium is discussed in terms of the effects of the acetonitrile in speeding the Arbuzov reaction and assuring the homogeneity of the reactive mixture for mutually insoluble methyl iodide and higher polyfluoralkylphosphites. The steric factor was found to have no effect on the reaction. The kinetics data obtained can assist in the synthesis of such methylphosphonates as bis(1,1,7-trihydroperfluoroheptyl)methylphosphonate. Details of the reaction are presented in the experimental section. References 12: 4 Russian, 8 Western.
[116-12131]

UDC 541.62 : 547.1' 119

SCILLATING SPECTRA AND CONFORMATION OF TRIMETHYLARSONATE MOLECULES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 17 Dec 80) pp 1594-1599

SHAGIDULLIN, R. R., KHALITOV, F. G., AVVAKUMOVA, L. V., CHADEYEVA, N. A. and ZHURAVLEVA, N. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov of Kazan' Branch, USSR Academy of Mciences

[Abstract] Trimethylarsonate was studied using oscillating spectroscopy and dipole-moment methods at various temperature intervals, aggregate states and dielectric permeability of the medium. All tests were in an argon atmosphere. Details of the tests are presented in the experimental section. Variations were observed in the number and intensity of bands, depending on changes in conditions such as phase, temperature, and polarity, indicating the conformational balance of the molecules resulting from retardation of rotation around the As-O bond. One rotamer had a cis-orientation of the OR group relative to the As-O bond, while another form corresponded to a conformer with an OCH_3 group in a transverse position relative to the As-O bond. Figures 1; references 13: 9 Russian, 4 Western.
[116-12131]

UDC 547.245

HYDROSILYLIZATION OF OLEFINS IN PRESENCE OF PHOSPHORYL COMPOUNDS OF NICKEL (II)

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 10 Dec 80) pp 1621-1624

MOLDAVSKAYA, N. A., SKVORTSOV, N. K., VOLOSHINA, N. F. and REYKHSFEL'D, V. O.

[Abstract] Catalytic properties were examined for various compounds with the general formula NiL_2X_2, where X is an acidoligand and L either a phosphine or phosphoryl ligand. Phosphonoxide compounds with σ-donor, weak field ligands were found to be as applicable for the reaction as phosphine compounds of similar composition (where $L=R_3P$). By varying the radical at the phosphorus atom, it was possible to change the alkalinity of phosphoryl oxide and the electron density on the nickel, thus increasing the yield of the reaction. Analogously, introduction of donor substitutes in the para position of the aromatic ring brought increased activity of the catalyst. Catalytic action seemed to proceed independently of other factors. The reaction could be controlled by varying properties of the phosphoryl ligand. References 9: 4 Russian, 5 Western.
[116-12131]

UDC 547.466 + 547.76

HEAT DECOMPOSITION OF ESTERS OF N-DICHLOROPHOSPHINE-N-ALKYLAMINOACETIC ACID

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 19 Jan 81) pp 1663-1664

NESTEROVA, L. I. and GOLOLOBOV, Yu. G., Institute of Organic Chemistry, UkSSR Academy of Sciences

[Abstract] Where N-phosphorylated esters of aminoacetic acid contain an ester group that tends to β-decomposition, they break down upon distillation in a vacuum at 150° C, producing olefin and hydrogen chloride along with 1,3,2-oxasophospholane-5-one. The product of heat decomposition from various esters have identical spectral characteristics, as determined by infra-red and proton magnetic resonance study, and identical physical properties. Details of the reactions involved are given in an experimental section. References 2: 1 Russian, 1 Western.
[116-12131]

UDC 547.26' 118

SYNTHESIS OF SPIROPHOSPHORANES WITH TWO DIOXAPHOSPHOLENE CYCLES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 26 Dec 80) pp 1664-1665

KUDRYAVTSEVA, T. N., PROSKURNINA, M. V. and LUTSENKO, I. F., Moscow State University imeni M. V. Lomonosov

[Abstract] Cyclic vinyl ethers of amidophosphoric acid were used to synthesize a new type of phosphorane with two dioxaphospholene cycles. The reaction was completed after 2 hours of boiling in benzene, and the structure of the products was determined by ^{1}H and ^{31}P nuclear magnetic resonance spectroscopy. One reference in Russian.
[116-12131]

UDC 547.26'118

REACTION OF DIMETHYLPHENYLETHOXYMETHYLENEAMIDOPHOSPHITE WITH NITRILES OF ALPHA-KETOCARBOXYLIC ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 30 Jan 81) p 1666

KONOVALOVA, I. V., CHERKINA, M. V., BURNAYEVA, L. A. and PUDOVIK, A. N., Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] The reaction produced 1:1 adducts in the form of crystalline substances that were difficult to dissolve in organic solvents. The structure of these dimers was established by infra-red and ^{31}P and ^{1}H nuclear magnetic resonance spectroscopy. Figures 1; references 3: 1 Russian, 2 Western.
[116-12131]

UDC 547.26' 118

ALCOHOLYSIS OF DIALKYLACYLPHOSPHITES WITH ALPHA-HYDROXYALKYLPHOSPHONATES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 12 Jan 81) pp 1667-1668

KONOVALOVA, I. V., MIRONOV, V. F., OFITSEROVA, E. Kh. and PUDOVIK, A. N., Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] In continued studies of synthesis of alpha-phosphorylated trialkylphosphites, the reaction of dialkylacylphosphite alcoholysis with

alpha-hydroxyalkylphosphonates was studied. Thermally stable compounds were produced that were free of amine hydrochlorides. While the reaction took place at room temperature after initail warming, the final elimination of acetic acid required 60-80° C of heat at a pressure of 20-30 mm of mercury. When an acyclic analog was used, considerable heating in a vacuum was required. The structure of the products was determined by infra-red and ^1H and ^{31}P nuclear magnetic resonance spectroscopy. References 5 (Russian).
[116-12131]

UDC 546.18

N-CARBAMOYLAMIDES OF IMIDOPHOSPHENOUS ACID

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 9 Dec 80) pp 1668-1669

MARKOVSKIY, L. N., ROMANENKO, V. D., RUBAN, A. V. and VOLKOV, G. I.,
Institute of Organic Chemistry, UkSSR Academy of Sciences

[Abstract] A new type of functionally substituted, stable amides of imidophosphenous acid was produced by the successful reaction of $\sigma^2\lambda^3$-phosphazenes without touching the double-coordinated phosphorus, when under mild conditions the acid's amide reacted with arylisocyanates forming N-carbamoy-shifted compounds, whose structure was determined by molecular weight, elemental analysis and infra-red and ^1H and ^{31}P nuclear magnetic resonance spectroscopy. Chemical shifts in the phosphorus atom indicated strong descreening that is typical for double-coordinated states. References 4: 2 Russian, 2 German.
[116-12131]

UDC 547.752'26.118.07

SYNTHESIZING 2-OXO-3-PHOSPHORYLATED INDOLE BY CYCLIZATION OF ARYLHYDRAZIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 5, Jul 81
(manuscript received 22 Dec 80) pp 1671-1672

GUREVICH, P. A., RAZUMOV, A. I., YAFAROVA, R. L., KOMINA, T. V. and
KUTUMOVA, F. Kh.

[Abstract] Hydrazides were synthesized by heating equimolar quantities of arylhydrazines with esters of phosphorylated carboxylic acid to 240-250° C. Indoles were produced by heating hydrazides to 200-220°C in the presence of condensing agents such as $POCl_3$, boiling benzene, toluene, CaO and $NaNH_2$. Proton- and nuclear magnetic resonance ^{31}P and infra-red spectroscopy confirmed the structure of the products obtained. References 5: 4 Russian, 1 German.
[116-12131]

UDC 547.118 + 547.442.5

REACTION OF 1,5-DIKETONES WITH DIPHENYLPHOSPHINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 5 Jan 81) pp 1673-1674

KALINOV, S. M., VYSOTSKIY, V. I. and TILICHENKO, M. N., Far East State University, Vladivostok

[Abstract] The relationship of 1,5-diketones to diphenylphosphine in a boiling dioxane medium in the presence of hydrochloric acid was studied. After 10 hours they reacted with 1 mol of diphenylphosphine, forming ketophosphonoxide, diketones, and various other compounds. References 2 in English.
[116-12131]

UDC 547.24

β-PHOSPHORYLATED ENAMINES: β-ETHOXYPHOSPHORYL-β-CYANOVINYLAMINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 12 Jan 81) pp 1674-1675

KOZLOV, V. A., BUVASHKINA, N. I., GRAPOV, A. F. and MEL'NIKOV, N. N., All-Union Scientific Research Institute for Chemical Plant Protection Agents

[Abstract] Cyanomethylenephosphonate and phosphonoacetic acid with varying acidity of the CH fragment were combined. Their synthesis showed that the acidity of the organic phosphorus compounds used had a distinct effect on the phosphorus-containing enamines produced by the reaction. The less acid phosphonoacetic acid does not condense with bissilylated formamide as readily as the more acid cyanomethylphosphonate. The structure of the enamines obtained was determined by infra-red spectroscopy. References 2 in German.
[116-12131]

UDC 547.454 + 547.26.118

INTERPHASAL CATALYZING OF ABRAMOV REACTION IN CARBOHYDRATE CHEMISTRY

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 51, No 7, Jul 81
(manuscript received 29 Dec 80) pp 1675-1676

ZHDANOV, Yu. A., GLEBOVA, Z. I. and UZLOVA, L. A., Scientific Research Institute for Physical and Organic Chemistry of Rostov State University

[Abstract] The authors showed that acetylated aldehyde monosaccharides readily react with dialkylphosphates under conditions of interphasal

catalysis, forming corresponding α-oxyphosphonates with up to 85% yield. The reaction was complete after 24 hours of mixing at room temperature, and the compounds obtained were then purified by crystallization from methanol or chromatography on silochrome. The structure of the products was determined on the basis of element analysis and infra-red and proton magnetic resonance. References 4: 3 Russian, 1 German.
[116-12131]

PESTICIDES

UDC [661.7:547.438.1'261'113].002.237

CHLOROPHOS PRODUCTION TECHNOLOGY IMPROVEMENT

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, Jun 81 pp 331-332

PANFILOV, V. Ya., ABRAMOV, I. A. and VARAKOSOVA, E. A.

[Abstract] Admixtures in chlorophos, which currently consists of 20% admixtures and 80% active ingredient, increase its toxicity and reduce its effectiveness and shelf life. A purer chlorophos with at least 98% active ingredient was obtained at a greater than 98% yield by precipitative crystallization from a neutralized chloroform solution with n-hexane, cyclohexane, petroleum ether and other hydrocarbons as precipitating agents. The content of active ingredient in chlorophos, a white powder, after 4 years of storage in a glass container at room temperature was 97.5%. Replacement of chloroform by carbon tetrachloride produced a neutral product with at least 96% active ingredient at a 98% yield. The use of 98% chloral and dimethylphosphite as reagents and carbon tetrachloride as the solvent produced a product with 97.98% active ingredient at a 96% yield. The yield increased to 100% with reuse of the filtrate. Carbon tetrachloride was regenerated by simple distillation. Use of technical-grade reagents and carbon tetrachloride produced chlorophos with 94-95% active ingredient. References 2 (Russian).
[105-9307]

PETROLEUM PROCESSING TECHNOLOGY

ACADEMICIAN URGES BRANCH STATUS FOR COAL CHEMISTRY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 21 Aug 81 p 2

[Article by UkSSR Academy of Sciences member L. Litvinenko, director of the UkSSR Academy of Sciences' Institute of Physical Organic Chemistry and Coal Chemistry: "Branch Status for Coal Chemistry"]

[Text] The tempo of scientific and technical progrsss can be judged by how our views and concepts change. The task of replacing petroleum with coal as a fuel was set quite recently and is now being resolved. Now, we are already talking about obtaining liquid and gaseous petroleum-product analogs from coal. "In the long term," Comrade L. I. Brezhnev stressed at the 26th Party Congress, "we should thoroughly develop the question of producing synthetic liquid fuel based on coals of the Kansk-Achinsk basin."

It is for good reason that interest in coal as a possible source of synthetic fuel has increased in recent years. Even with all the considerable petroleum reserves on the Earth, it is already obvious that they will be used quickly. At the same time, it is in principle wasteful to use coal as is being done today, as a solid fuel and as a raw material for by-product coke industry. Burning it directly leads to losses of valuable chemicals. Moreover, it is accompanied by environmental pollution in the form of combustion by-products and ash.

At the same time, coal can yield practically all the products provided today by oil refining, right up to the engine fuels in shortest supply. It is just such an approach which is outlined in one of the comprehensive scientific-technical programs anticipated in the five-year plan. Many research, planning and design collectives, enterprises and construction organizations, are taking part in carrying out this program, including our Institute of Physical Organic Chemistry and Coal Chemistry, of the UkSSR Academy of Sciences.

We have taken several paths in solving the problem of obtaining synthetic liquid fuel. One is traditional: direct burning by saturating with hydrogen. For the experiment, we used the cheapest coals in the country, lignites of the Kansk-Achinsk basin, which contain considerable hydrogen themselves. It was thus easier to dissolve them. The initial stage in the whole complex of research on so-called light hydrogenation yielded rather good results. For the first time, practically all the organic bulk of the coal was dissolved without using solvents, just by selecting an effective reaction accelerator.

Nonetheless, we think hydrogenation alone will not solve the problem of obtaining liquid fuel from coal. We need to depart more boldly from the traditional methods and seek out fundamentally new solutions. One is the action of chemicals on coal under extreme conditions, such as high pressure with simultaneous treatment by ultrasound or the use of hydroextrusion effects. Work we did jointly with Donetsk Physical-Technical Institute of the UkSSR Academy of Sciences indicates this is a promising direction. Under laboratory conditions, with appropriate treatment, we succeeded in dissolving 90 percent of the coal in organic solvents.

These research results could be used not only to develop technology for obtaining liquid fuel, but also to solve such very important problems as mining coal without people or mine shafts. Mines without miners is an ancient dream of mankind. But now it no longer seems fruitless: the time is coming when people will learn to pump coal to the surface after dissolving it right in the seams, just as petroleum is now being pumped from wells. And the very word "miner" may become a thing of the past. This will not happen tomorrow, of course, but the first steps towards actualizing this idea have already been taken.

Many contemporary problems of coal chemistry look different in the long-range view, including that of the anticipated high cost of liquid fuel from coal. It can be reduced appreciably if coal processing is run on a comprehensive basis.

It must be acknowledged that we do not know yet what the potential possibilities of coal are in terms of its high-molecular structure. The possibility is not excluded that man will sometime learn to obtain from it something like an "elixer of life," becoming a worthy successor to the popular ginseng. In any case, the "elixer" being created at our institute for agriculture, to stimulate the growth and development of practically all plants, is already being tested. We have called it URV, for "coal growth substance."

This compound is an aqueous solution of humic acids obtained from lignites using technology developed at the institute. Its method of application is simple and the dosage is inconsequential, thousandths of a percent. Tests have been run for several years now on various farms here, almost always yielding positive results: yields are increased 30-100 percent, depending on the type of crop and local conditions. Moreover, growing time is reduced by an average of 10 days, which is especially important for early vegetables and grains. It is too early, of course, to draw final conclusions, until the tests are complete, but we hope that the low cost, effectiveness and ease of application promise a bright future for this new growth stimulant.

The growth stimulant is just one of many useful products which can be obtained with the comprehensive processing of coal. It can yield sulfonated coal, which is used to treat power plant water, effective catalysts for synthesizing a number of dyes, raw material for obtaining heat-resistant plastics, nutrient media for growing protein stock microbiologically.... Several of the, alas, few coal products are already being used in the national economy. Others exist only in laboratory flasks or on the "tip of the pen" of our researchers. Bringing them into everyday use is a most important task of coal chemistry.

No less pressing a problem of coal chemistry, that of using the numerous products generated by heat-treating coal merits special discussion. This relates first of all to by-product coke industry production, which consumes considerable solid fuel.

It produces as by-products an enormous amount of chemicals, some of which are processed into carbon black or road pitch. But the bulk are simply burned as production wastes. At the same time, many of these "wastes" could bring the state millions in profits.

For example, associates at our institute and the "YuZhNIIgiprogaz" have obtained the "Donbass-1" inhibitor from little-used coke-chemical products, practically from wastes. For several years now, it has been protecting Orenburg gas field pipelines reliably from hydrogen sulfide corrosion in place of the imported inhibitor previously used in "Orenburggazdobycha" association. The economic impact is 1.2 million rubles per year.

Demand for this inhibitor increasingly outstrips supply. Tyumen' oilfield workers alone need more than 2,000 tons per year, but "Donbass-1" is being produced in considerably lesser amounts, and Orenburg takes almost all of that. Attempts are made to explain the limited production as being due to insufficient raw material, but in fact, it literally flies out of the coking battery stacks, polluting the air.

No in-depth analysis is required to establish that no one is truly interested in developing the chemical wing of coal processing. The Ministry of Coal Industry is concerned only with mining. The Ministry of Ferrous Metallurgy -- only with coke production. The consumer needs only the end product. It has nothing to do with who gets it or how. And so it turns out that no one is in charge of the problem of using coking by-products.

This example, like a drop of water, reflects the situation which has developed today in coal chemistry. Paradoxical as it may seem, coal chemistry has now been transformed into a branch...between branches. The absence of a single purpose, common interests and a comprehensive approach is felt even in the scientific research stage, in organizations of the Ministry of Coal Industry, Ministry of Ferrous Metallurgy, Ministry of Electrification and Power Engineering, Ministry for Mineral Fertilizers Production, and in a number of the country's VUZ's. Only a portion of this research is covered by the above-mentioned comprehensive program associated with obtaining synthetic fuel from coal. And as concerns many other problems, the failure to concentrate efforts sometimes leads to duplication. It is often hard for coal chemists to articulate where to apply their efforts: what seems important to some may already have been solved or might be being solved by others.

Of course, scientists working in one field seek out roads to one another, concluding creative cooperation agreements and holding joint conferences and seminars. But all this is more in the way of random contacts than joint, purposeful work. The time seems right for dealing with the question of creating a single scientific center to take on the task of coordinating research, determining the primary directions for developing coal chemistry and facilitating the planned introduction of the results obtained. The necessity for such a center is especially urgent in the face of those difficulties which may arise in the very near future.

The prerequisites for this are already evident today, in the example of that same comprehensive synthetic fuel program. I am afraid that the delay in carrying out a number of its stages (in particular, the creation of pilot plants) has been caused by that very absence of common interests. The very fact that organizations of many ministries and departments are taking part in implementing this program can be explained as being an effort to use all the experience and scientific resources accumulated in this field. But the question of large-scale production will arise later, and who will then be concerned with it? The production of liquid and gaseous fuels, not to mention other coal products, will hardly be among the top-priority tasks of, say, the Ministry of Electrification and Power Engineering or the Ministry for Mineral Fertilizers Production.

At the same time, we have a graphic example of a fundamental solution to the problem. When the question of large-scale oil refining arose, so did a corresponding branch, petrochemistry. In the years just ahead, coal chemistry promises to become no less important a component of the country's economy. It is not essential that a ministry be created "out of" it, but it must in the end acquire the status of an independent branch, evidently within the Ministry of Coal Industry.

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CSO: 1841/141

SYNTHETIC LIQUID FUELS FROM COAL

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 30 Jun 81 p 2

[Article by Academician A. Sheyndlin: "Awaiting the Experiment"]

[Text] "Looking to the future, we should also develop thoroughly the question of producing synthetic liquid fuel based on coals of the Kansk-Achinsk basin." This was a task Comrade L. I. Brezhnev set in the report at the 26th Party Congress. There is no doubt as to its importance. It is known that world hydrocarbon fuel reserves -- petroleum and gas -- have been used extremely fast in recent decades; these fuels are today the basis of power engineering in a majority of the developed countries, but long before the threat of exhausting these reserves becomes real, mankind will encounter difficulties connected with the peculiarities and possibilities of both prospecting for and developing new deposits.

In view of these peculiarities, according to forecasts made at the 11th World Power Engineering Conference in Munich this past year, world petroleum extraction will reach a maximum of four billion tons around 1990 and will then gradually diminish. Maximum gas extraction is expected to occur between the years 2000 and 2020. Growing difficulties in prospecting and extracting will also lead to a steady rise in petroleum and gas prices. Clearly, under these conditions, hydrocarbon resources must be saved in every way possible. Even now, steps must be taken to replace them with synthetic products obtained from more plentiful raw material.

Coal, first of all, is such a raw material: world reserves are five times greater than for petroleum and gas combined. Solid fuel resources within the USSR comprise about 40 percent of the total world reserves, making prospects for their use especially important for our country. Coal can obviously replace that portion of the petroleum products being used today as boiler and furnace fuel. As oil refining intensifies, the proportion of light products will increase and that of fuel oil will decrease. Replacing fuel oil with coal is therefore a task for today. But coal can also be used to obtain motor fuels which are today practically the only fuel for various types of transport. And coal is also a source of valuable chemical raw material.

In and of itself, this is not a new idea. The first plants to obtain synthetic liquid fuel (SLF) were built about 50 years ago, but their output turned out to be so expensive that these enterprises were closed as soon as new deposits of petroleum were found throughout the world, including in this country.

The unfortunate thing is that the methods used previously are not suitable for obtaining liquid fuel from coal on a large scale. We need fundamentally new technology which is economical and highly productive. Generously financed programs to find that technology exist in the USA, FRG, Britain and other countries, but no one has yet found a suitable solution to the problem. In this regard, the U.S. experience is instructive. Researchers and developers have taken the path of creating a large number of pilot plants so they can choose the best of the technologies and be ready to build large plants.

In our country, research in this area has in preceding years been done by various organizations, basically on their own initiative, without proper coordination. But in the current five-year plan, this work has become an integral part of a target comprehensive program approved by the USSR Gosplan, USSR State Committee for Science and Technology and USSR Academy of Sciences.

We anticipate carrying out a broad complex of fundamental and applied research and creating and beginning experimental operation of a number of large installations within the framework of this program. In this regard, three possible methods of obtaining liquid fuel from coal have been selected as the basic ones.

The first is coal gasification to obtain so-called synthesis gas. And various kinds of motor fuel are already being obtained from it. The task is to make both the gasification process itself, as well as subsequent synthesis processes, more efficient and productive, and most importantly, to lower their cost. The key to resolving these tasks lies in using high temperatures and pressures, highly intensive processes, and in developing inexpensive new, specialized catalysts.

The lead department for developing these processes is the Ministry for Mineral Fertilizers Production, including "Azot" production association, the GIAP [State Scientific Research and Planning Institute of Nitrogen Industry and Organic Synthesis Products], a number of academy institutes and VUZ's as implementers. In particular, the program assignments in this direction propose the renovation of a gasification installation at "Azot" production association in Shchekino to work with coal and the creation of pilot installations at Shaturskiy Division of the USSR Academy of Sciences' Institute of High Temperatures.

Hydrogenation, saturating coal with hydrogen, is the basis of the second method of obtaining synthetic fuels. As is known, hydrogen comprises 14-15 percent of the hydrocarbons which are the basis of liquid motor fuels. Lignites ordinarily contain no more than 3-5 percent hydrogen. The hydrogenation process adds the missing hydrogen at temperatures on the order of 500 degrees and pressures of several hundred atmospheres. As a result, the organic basis of the coal is restructured and it is transformed into a mixture of liquid hydrocarbons with a composition close to that of crude oil.

Work is being done along this line by organizations of the Ministry of Coal Industry. In particular, the Institute of Mineral Fuels has already created and put into operation a laboratory installation for obtaining synthetic liquid fuel by hydrogenation. But its scale does not permit drawing final conclusions as to the potential of this method in commercial installations. The comprehensive program therefore plans the 1983 start-up of the first pilot facility of this type, the "ST-5" (with a productivity of five tons of coal per 24-hour period), at "Bel'kovskaya" mine in

Podmoskovskiy coal basin. And a larger installation, the "ST-75," is to begin operation a year later at Berezovskiy cut in the Kansk-Achinsk basin, Subsequently, based on the results from operating these facilities, data must be issued for designing a powerful pilot commercial facility, the "ST-500."

Finally, the third method, which is based on pyrolysis, high-temperature decomposition of coal in an inert medium. The products of this process are some liquid resin, solid semicoke and fuel gas. However, the resin alone, which can be made to comprise 15 percent, is in principle suitable for obtaining some motor fuel and valuable chemical raw material.

Work along this line is being done by collectives of the Ministry of Electrification and Power Engineering, and in particular, by the State Scientific Research Power Engineering Institute imeni G. M. Krzhizhanovskiy. As a result of research done in the laboratory and at a small pilot facility, the "ETKh-175" pilot plant, capable of processing 175 tons of coal per hour, is being built in Krasnoyarsk. According to the plan, it is to begin operating late this year. Experience in operating it will be the basis for working out the technical-economic substantiation for a large commercial energy-technology facility.

The status of work along the enumerated three basic lines is such that not one has yet proven preferable over the others. Moreover, it is even hard to compare them. Let's say the last of the methods cited, that based on pyrolysis, could enable us to create powerful commercial facilities in the foreseeable future. But the methods of converting the resin obtained into motor fuel have not yet been worked out, nor have the problems of using the semicoke been solved. On the other hand, no satisfactory solution yet exists for separating the liquid products and sludge obtained in the hydrogenation process, nor have questions of reclaiming the catalyst, obtaining hydrogen, and others, been worked out. But then nearly all the organic coal product obtained using this technology can be converted into motor fuel.

A comparison of the other methods also yields approximately the same ambiguous picture. The task therefore is to force work along all the main lines in every way possible. Only then, on the basis of pilot commercial testing, can a final choice be made of a particular commercial technology. It may also turn out that we will be forced to build plants using two or even all three plans, if appropriate based on the nature of the concrete tasks being resolved.

However, such indefiniteness as to final conclusions in no way signifies that obtaining liquid fuels from coal is a matter for the distant future. Consequently, we must not delay in taking up this problem. Unfortunately, we have already lost time in this area: whereas our fundamental research is not inferior to foreign research, things are considerably worse in the area of engineering resolutions and experimental verification.

Thus, after spending several years on research and planning, the Ministry of Coal Industry is not actually ready to create a pilot commercial facility to process 500 tons of coal per day. Construction of the "ETKh-175" facility at Krasnoyarsk is not yet complete, although the Ministry of Electrification and Power Engineering was to have put it into operation back in 1979. The problem of renovating facilities at "Azot" association is also being solved slowly. We therefore need first of all to put all facilities anticipated in the comprehensive program into operation faster.

The scale of the comprehensive program is such that scientific research and planning institutes, enterprises and construction-installation organizations of 20 ministries and departments are taking part in solving its problems. In view of the tight schedules, each participant needs to apply itself to the tasks entrusted to it with maximum responsibility, and the lead implementers need to ensure precise interaction in and coordination of this work.

11052
CSO: 1841/141

BRIEFS

SHALE FUEL--Thanks to work by scientists at the Peat Institute of the Belorussian Academy of Sciences, yet another underground treasure of the Poles'ye will become accessible to mankind. They have proposed a method of processing local fuel shales, with reserves of billions of tons, into liquid synthetic fuel. This man-made "petroleum" is like natural petroleum in composition, as gasoline and other cracking products can be obtained from it. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 19 May 81 p 2] 11052

CSO: 1841/141

RUBBER AND ELASTOMERS

RESULTS OF TECHNICAL RUBBER PRODUCT INDUSTRY DEVELOPMENT DURING 10TH FIVE-YEAR PLAN AND GOALS FOR 1981-1985

Moscow KAUCHUK I REZINA in Russian No 7, Jul 81 pp 3-5

PAVLOV, V. B.

[Abstract] During the 10th Five-Year Plan the production volume of rubber articles increased by 23.8%. About 510 million rubles were invested in reconstruction, enlargement and in new equipment in existing plants. Several large plants were opened, increasing the production capacity. New processes were introduced based on improved technology. About 58 new products entered the production stage. There was an increase in the operational range of various items used in the range from -60°C to 250-300°C; performance of tractor parts was extended from 5000 to 6000 motohours. Extensive effort was devoted to improving the cultural level and welfare of the workers: housing was improved, recreational facilities were enlarged, pay was raised. Some negative aspects concerned a continuously inadequate supply of starting materials, slow improvement in research problem areas and inadequate management. Out of 26 plants, 11 failed to achieve the goals of the five-year plan. Another acute problem concerned recycling production waste: only 14.5% of the byproducts and waste material is recycled. This task needs attention. Low level of mechanization and automation is also a big factor in retarding production growth.
[112-7813]

UDC 678.675.4.4 : 667.636

MODIFICATION OF RESIN MIXTURES BASED ON SKS-30 ARM15 PRODUCTS OF REACTION OF ALIPHATIC DIAMINES WITH AROMATIC DISULFOCHLORIDES

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHNOLOGIYA in Russian Vol 24, No 4, Apr 81 (manuscript received 26 Oct 79) pp 499-502

POLYAK, M. A., CHEKANOVA, A. A., SVESHNIKOV, S. N. and MOSKVICHEV, Yu. A., Department of Chemistry and Technology of Elastomer Processing

[Abstract] The modification of resin by introducing a combination of aliphatic diamines with aromatic disulfochlorides into the resin mix was studied. During preparation of the mix and vulcanization, these substances can enter a condensation reaction. Amines should increase the mixture's resistance to precuring, since they do so when disulfochloroaromatic compounds are used as vulcanizing agent. The use of hexamethylene and disulfochloride benzene increased the cohesion durability of the resin mix and improved various technical properties, particularly the dynamic strength of the resins. Disulfochloroaromatic compounds improved the thickening of the vulcanized matrix and increased the durability of the resins during stretching. The process is recommended for use with resins based on butadiene styrol rubbers. References 8 (Russian).
[118-12131]

UDC 678.043:678.548.517:678.063.678.762.2+672.2+678.762.2-1361.352

EFFECT OF VULCANIZING GROUP TYPE ON CRYSTALLIZATION OF VULCANIZATION PRODUCTS OF CIS-BUTADIENE AND BUTADIENE-NITRILE RUBBER COMBINATIONS

Moscow KAUCHUK I REZINA in Russian No 5, May 81 (manuscript received 26 Nov 79) pp 21-24

VORONOV, V. A., KOSTRYKINA, G. I. and ZAKHAROV, N. D., YaPI

[Abstract] The goal of this study was to investigate crystallization of cis-polybutadiene (PB) containing 96% 1-4 bonds in rubbers produced from PB mixed with butadiene-nitrile rubber (BNK) using sulfur and thiuram vulcanizing agents. It was shown that with the PB:BNK ratio of 3:1, the increased degree and rate of crystallization of sulfur rubber is due to a lower extent of crosslinking and smaller fraction of polysulfide bonds. With a 25% content of PB the accelerating action is counteracted by irregularities in the molecular chains due to cis-trans isomerization. As a result the crystallization curve is shifted toward less additive values, increasing somewhat the period of crystallization. The BNK particles serve as crystal seeds, accelerating the process. In the case of thiuram rubbers, an increased crystallization was expected because of lesser crosslinking in PB. However, the opposite was observed. Overall it was shown that PB crystallization in rubbers depends on the type of vulcanizing group.

When it does not provide sufficient interaction at the phase separations, the crystallization rate is determined by changes in the vulcanization structure of the crystallizing rubber and on the ability of the second component to act as crystal seeds. When the interaction at phase separation is facilitated, the crystallization depends on the development of an interphase layer. In both cases the formation of crosslinking bonds is a very important factor. Figures 3; references 13: 12 Russian, 1 Western.
[115-7813]

UDC 678.076-19:678.762.2:678.028

VULCANIZATION OF RUBBER MIXTURES BASED ON GRANULATED CIS-POLYISOPRENE

Moscow KAUCHUK I REZINA in Russian No 5, May 81 (manuscript received 24 Sep 79) pp 18-21

PANKRATOV, V. A., ZAKHARKIN, O. A., ZAKHAROV, N. D. and SHILOV, A. D., Scientific Research and Design-Construction Institute of Carbon Pigments and Fillers, YaPI

[Abstract] The goal of this study was to determine the effects of mechanical granulation of isoprene rubber combined with premixing of rubber granules with other rubber ingredients in dry state on the structural processes taking place during vulcanization and on the properties of the end products. Experiments showed that the use of powder-like rubber granules in preparation of the mixtures for vulcanization assures the formation of a dense, homogeneous and non-defective vulcanization network, resistant to destructive processes. Changes affecting the molecular structure of the polymer which take place during the granulation process weaken somewhat the vulcanization network of the granular rubber. However, these destructive processes may be counteracted by technological advances, so that rubbers produced from the granular compositions show better physical and mechanical properties than products obtained by traditional methods. (A. A. Dontsov participated in evaluation of this work.) Figures 5; references 13: 10 Russian, 3 Western.
[115-7813]

UDC 678.762.2:539.389:543.42

LOW FREQUENCY RELAXATION PROCESS IN ELASTOMERS

Moscow KAUCHUK I REZINA in Russian No 5, May 81 (manuscript received 15 Sep 80) pp 15-18

SIDOROVICH, Ye. A. and PAVLOV, G. N., All Union Scientific Research Institute of Synthetic Rubber imeni S. V. Lebedev

[Abstract] A novel relaxation process occuring in polymers in their highly elastic state was studied on model systems, using 1,4-polybutadiene with

40-50% cis-1,4-bonds, 50-40% trans-1,4-bonds and 10% 1-2 bonds. This process was observed in binary rubber mixtures with different molecular weights and narrow molecular-mass distribution. It was shown that at different ratios of the components, the temperature-frequency location of the maximum of the change in the tangent of the degree of mechanical losses remains unchanged. Its location is determined by the molecular weight of the lower molecular component. At the same time, tg δ_{max} increases with increased content of the low molecular component. At low frequencies, all curves are superimposable with the curve of the starting high molecular component. The tg δ_{max} changes very little with formation of chemical crosslinkages between the binary components. It was concluded that this relaxation process is connected with the display of the mobility of the low molecular component. Due to this process, this low molecular component is excluded from the physical network, which then is formed only from the contact points of the high molecular component. Figures 6; references 5 (Russian).
[115-7813]

UDC 678.84.074

SYNTHESIS STRUCTURE AND PROPERTIES OF POLYBORODIMETHYLSILOXANES

Moscow KAUCHUK I REZINA in Russian No 5, May 81 (manuscript received 15 Sep 80) pp 10-12

ZINCHENKO, G. A., MILESHKEVICH, V. P. and AVER'YANOV, S. V., All Union Scientific Research Institute of Synthetic Rubber imeni S. V. Lebedev

[Abstract] The effect of Lewis acids on the reaction of H_3BO_3 with polydimethylsiloxanediols at 160-165°C was studied, because it leads to formation of oligoborodimethylsiloxanes with a high content of boron. Halogen-containing compounds ($FeCl_3 \cdot H_2O$, $AlCl_3$, PCl_5, dimethyldichlorosilane and chloropolydimethylsiloxanes) were used as catalysts. The reagents were heated with stirring to 160°C, kept at this temperature for 6-8 hrs until transparent films could be obtained from the oligomers. All catalysts showed effective activity, decreasing in the following order: $FeCl_3 \cdot 6H_2O > AlCl_3 \cong$ chloropolydimethylsiloxane $\cong$ dimethyldichlorosilane $> PCl_5$. Without the catalysts, no transparent polymer could be obtained. Borosiloxane oligomers (BSO) are unstable hydrolytically, their hydrolysis occuring even with atmospheric moisture or with the moisture contained in the ingredients of the resinous mixture. On the basis of NMR, IR spectroscopy and gel-chromatography, BSO is a mixture of linear oligomers with their chains terminating in fragments of boroxane bonds. Figures 1; references 7: 3 Russian, 4 Western.
[115-7813]

SYNTHETIC RUBBER INDUSTRY IN 11TH FIVE-YEAR PLAN

Moscow KAUCHUK I REZINA in Russian No 5, May 81 pp 3-5

SAZYKIN, V. V.

[Abstract] From 1965 to 1980 a solid base was created in the synthetic rubber industry, assuring adequate supplies for the increasing needs of rapidly developing related industries. The USSR became the second largest producer of synthetic rubber in the world. The need for natural rubber dropped to a third of the previous requirements. For the period 1981-1985 and later, the task remains to increase the effectiveness and quality of production while maintaining the necessary volume. The goal is to reduce imports of natural rubber and latex to zero. New general purpose rubbers will not be developed; there will be changes in the need for various types of rubber produced, improving their quality while lowering labor, material and financial investment. Soviet rubber compares favorably with foreign products. Selection of new catalysts for stereospecific polymerization, basic changes in technology and improvements in equipment and automation of the processes will make it even better. Packaging and transportation of the finished products currently are inadequate (leading to degradation of the material) and need improvement. Projections have been made for doubling the production of SKEPT, BNK, liquid rubber and other products of specialized application. Production expansion will be achieved by building new large plants, improving the technology and selecting new starting materials.
[115-7813]

UDC 678.01.:678.742.2-139:845.254.32

PROPERTIES OF CHLOROSULFONATED TERNARY COPOLYMER 'SKEPT'

Moscow KAUCHUK I REZINA in Russian No 5, May 81 (manuscript received 4 Nov 80) pp 9-10

KADYKOV, V. V., BALAKIREV, Ye. S. and KOCHKIN, D. A., Moscow Institute of National Economy imeni G. V. Plekhanov

[Abstract] Properties of chlorosulfonated ternary copolymer of ethylene, propylene and dicyclopentadiene (SKEPT) were investigated. Powdered SKEPT was dissolved at 65-75°C in CCl_4 and chlorosulfonated for 6-7 hrs to yield the desired product KhSSKEPT. Physical-chemical and mechanical properties of this latter product are reported. KhSSKEPT is an elastic mass soluble in chlorinated aromatic and aliphatic hydrocarbons, but insoluble in oils and acids. Vulcanization coatings were prepared from KhSSKEPT to show that they surpassed commercial elastomers in respect to their resistance to the action of solar radiation, ozone and various aggressive media. Figures 1; references 3 (Russian).
[115-7813]

UDC 674.04

WOOD TREATMENT WITH EPSILON-CAPROLACTAM AND ITS SUBSEQUENT POLYMERIZATION

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 54, No 8, Aug 81
(manuscript received 16 Oct 79) pp 1908-1911

VRUBLEVSKAYA, V. I. and NIKITCHENKO, L. A., Institute of Mechanics of Metal-Containing Polymer Systems, Belorussian SSR Academy of Sciences

[Abstract] Birchwood samples were employed in studying the physical-chemical processes accompanying hydrolytic and anionic polymerization of epsilon-caprolactam (ECL) within the wood following its treatment with ECL. The thermal data and IR spectra showed that attempts at anionic polymerization of ECL within the pores and capillaries of the wood failed due to alkaline hydrolysis of the wood components. Hydrolytic polymerization at 170-180°C for 4 h in air under normal pressure resulted in a polymer yield of 8-12% of the theoretical yield of polycaproamide, which formed bonds with the woody tissue to enhance the thermal stability of the treated wood. Similar polymerization studies conducted with lignin and cellulose also yielded enhanced thermal stability as a result of the ECL polymerization. Figures 2; references 6 (Russian).
[3-12172]

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